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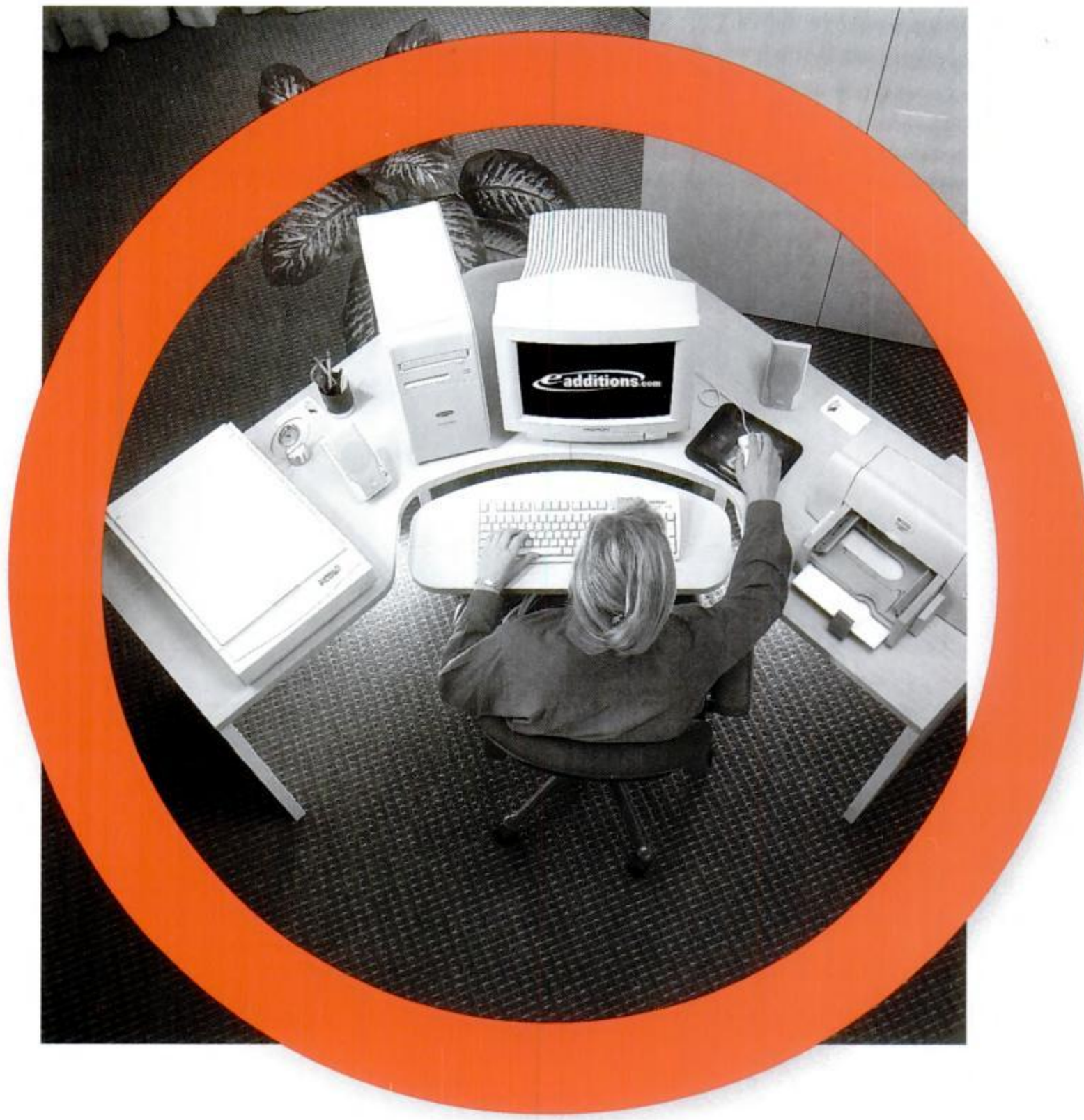

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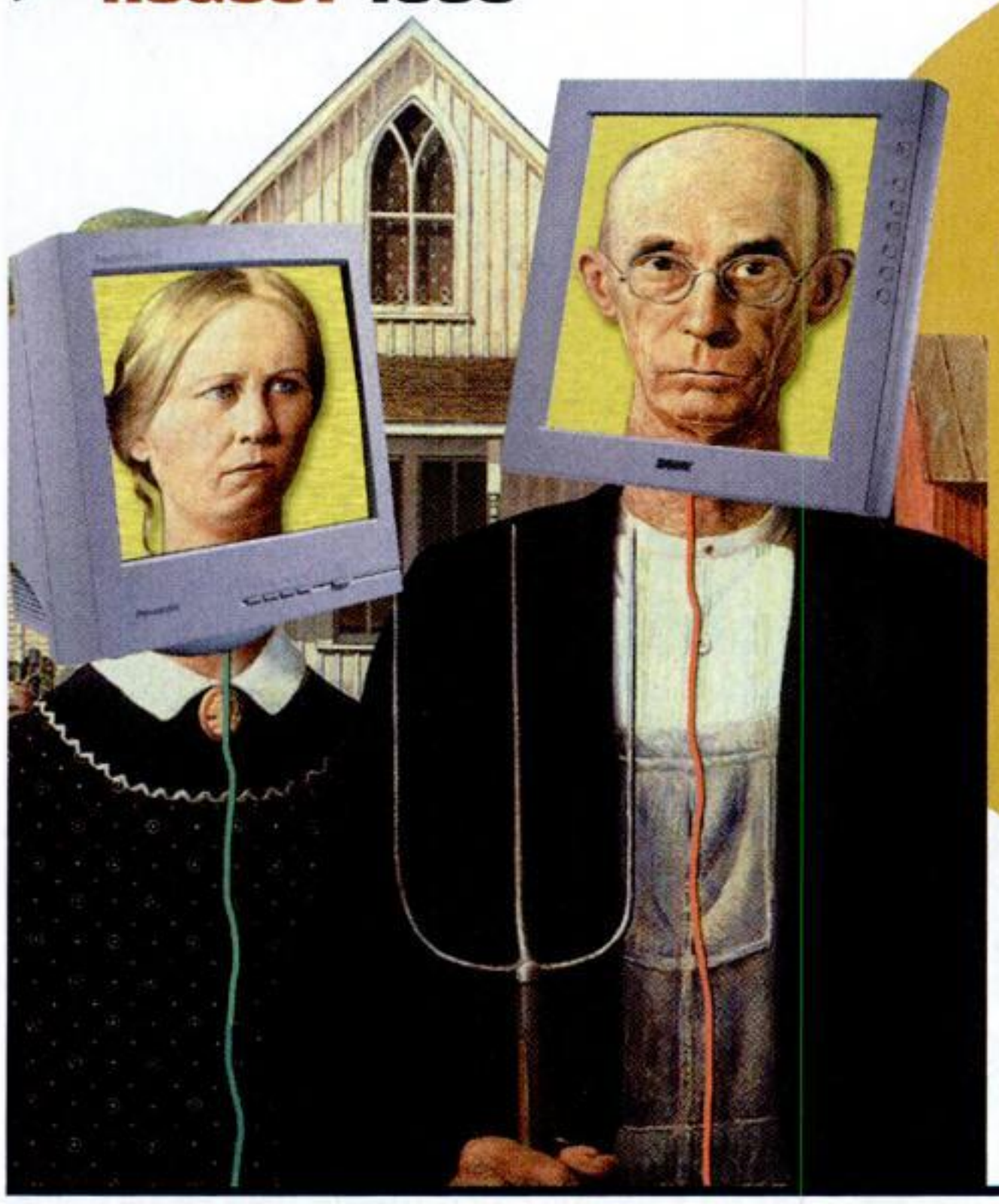
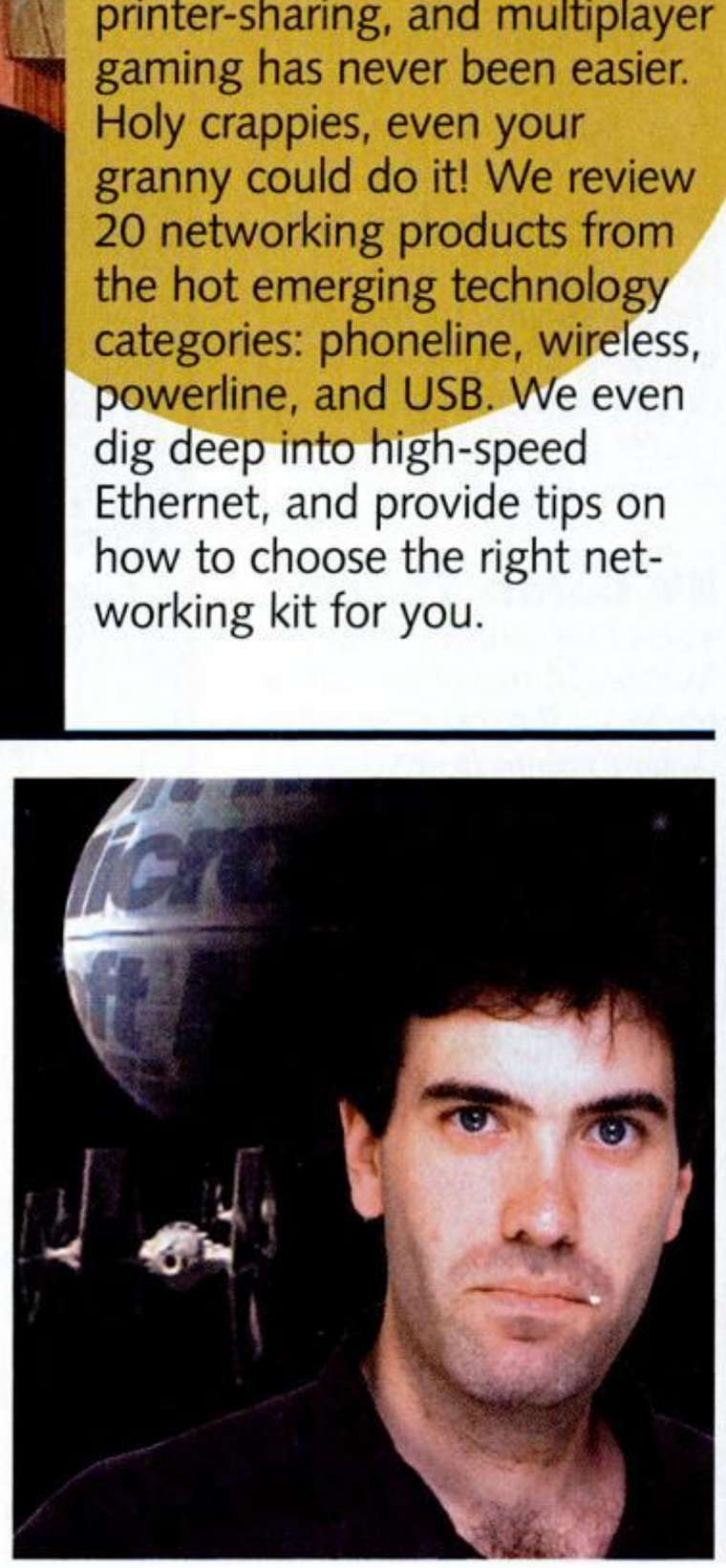


46 Down-Home Networking

Connecting two computers together for file-swapping, printer-sharing, and multiplayer gaming has never been easier. Holy crappies, even your granny could do it! We review 20 networking products from the hot emerging technology categories: phoneline, wireless, powerline, and USB. We even dig deep into high-speed Ethernet, and provide tips on how to choose the right networking kit for you.

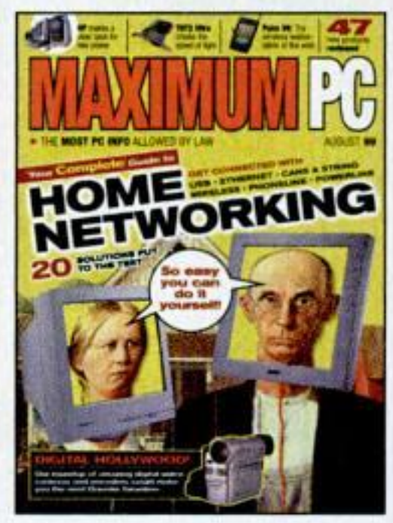
40 The Empire Talks Back

A long time ago, in a galaxy far, far away, Microsoft's Imperial Forces initiated a technology battle plan called DirectX. It now runs the majority of today's most advanced computer simulations. Kevin Bachus, one of the master strategists behind DirectX, reveals the Empire's upcoming secret plans.



63 Digital Hollywood

Why mess with analog videotape when you can shoot and edit your home movies 100% digitally? We put four digital movie cameras and two MPEG encoder cards through the *Maximum PC* screen test. Our production schedule ends with an extra-special effect you'll remember from the worst sitcoms of the 70s.



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35 Fast Forward
Resident proccessortradamus **Tom Halfhill** has seen the future of CPUs, and this month he explains why wider isn't necessarily better than faster.

37 On the Line

Net nurse **Shel Kimen** is concerned about you. You should really go see a doctor, or at least visit one of the health sites she writes about this month.

39 Game Theory

Voice of reason **T. Liam McDonald** makes an annual tradition of explaining why violent games don't create violent kids. This year's entry is particularily timely.

104 The Saint
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21 Inside Sources
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▶ Mysterious charges are appearing on consumers' credit-card bills for online services they haven't ordered, and the unsuspecting cardholders (who might not even have a computer) are paying up. We tell you why you should check your bills closely.

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▶ **Spin Cycle:** 3dfx and Creative go to war; the final nail is driven into the Divx coffin; and the Rio gets a new lease on life.

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25 Watchdog
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31 Lab Notes NEW!
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68 Ask the Doctor
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70 White Paper
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101 Terminator
We explain all those underlined words here.

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33 Peripheral Vision
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75 Reviews
We will review no product before its time.

We uncork **HP's** 550MHz **Pavilion** and **Fujitsu's LifeBook**, nibble on the latest **anti-virus utilities** and color **CE devices**, and sip **Red Hat's Linux 6.0** and **3Com's Palm VII**. We then set the mood with three hot, new TNT2 Ultra videocards. And for dessert, get ready for an in-depth look at **Apache Havoc**, and **Fleet Command**. Lastly, we finish with **bleem!**, software that turns your PC into a **PlayStation**.

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Rust Never Sleeps

The most hotly requested section has to be Glitch, which will resume in the September issue.

It's hard to believe, but the next issue of *Maximum PC* represents our first anniversary under the new banner. In addition to immensely popular new sections, such as Ask the Doctor, Watchdog, and the Terminator, we've had an opportunity to cover some of the most exciting new technology of the past year, including immersive 3D audio, wicked-fast Ultra ATA/66 hard drives, and sexy flat-panel displays. And with this issue, you can add home networking, wireless PDAs, and color palmtops to that list.

In addition to all the great new things in the magazine, we also have great new things going on online. As I write these words, we have just launched our new Forums section of the **maximumpcmag.com** web site. This replaces the site's previous Comm Port, Watchdog, and Ask the Doctor sections, which frequently suffered from lag as we struggled to keep up with posting all your messages. With the new software, your messages are posted immediately and it's easier for the *Maximum PC* crew to respond. Much better.

Also relatively new online is the **Maximum PC Network**, which resides at our old **maximumpc.com** domain. In case you haven't checked it out, here's the lowdown: producer Ed Homich pulls together the best new content from our 20+ affiliated partners—including Ars Technica, Beta Bites, and The Storage Review—and points you straight to the best PC info on the web.

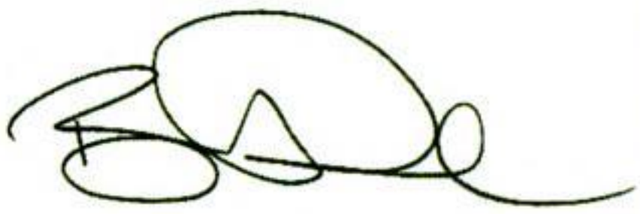
And more big online changes are planned in the coming months, including the return of our fabled game server and live chat sessions with the editors and industry muckety-mucks.

Along with new fodder come two new faces to the *Maximum PC* posse. Joltin' Josh Norem joins us as Associate Editor, and at the Copy Editor slot, Kristen Salvatore has stepped in. I know you'll welcome them aboard. And stepping out the revolving door this month is our long-time columnist, Alex St. John. As our resident Microsoft defector, The Saint always provided a controversial read, whether you loved him or hated him. Check out his sign-off on the last page of this issue.

But with this departure comes the revival of some popular sections. White Paper, a personal briefing on today's latest technologies, and 12-Step, your guide to dealing with a PC obsession in 12 easy steps, are back by popular demand. I'm sure these will be even more popular in *Maximum PC*. But the mostly hotly requested section has to be Glitch, our irreverent look at tech that will resume in the September issue and assume the Saint's slot in the back of the book.

All said, we have tons more for you to look forward to in the coming months: new demanding benchmark tests, new score scales to challenge cutting-edge boxes, and a killer new project that should make Linux fans very, very happy. I'll have more on this news soon.

As we turn the corner on the second half of 1999 and on our second year, we look forward to bigger magazines with more pages, and delivering more of the best, in-depth, unbiased PC info that you've come to expect from *Maximum PC*.



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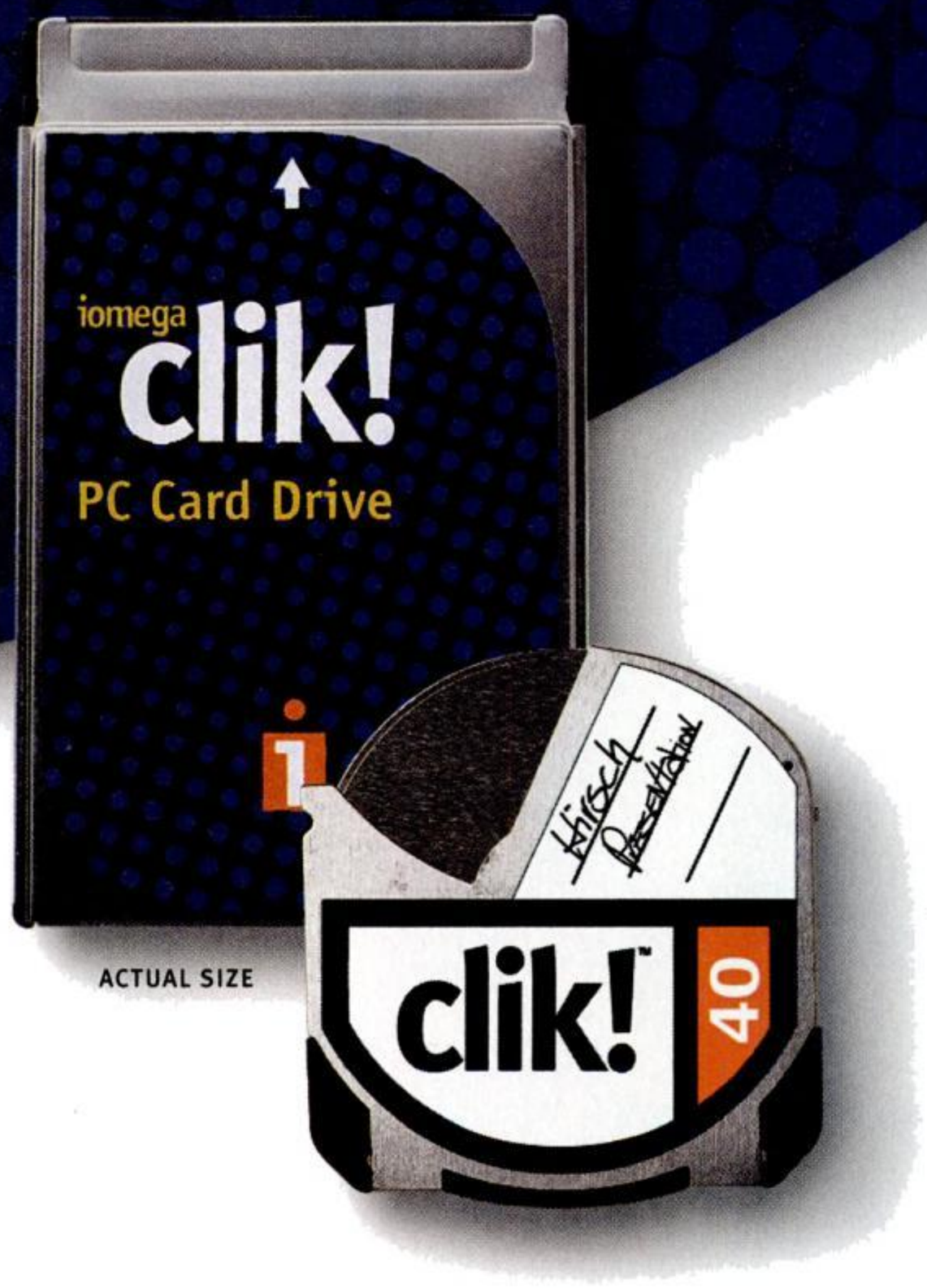
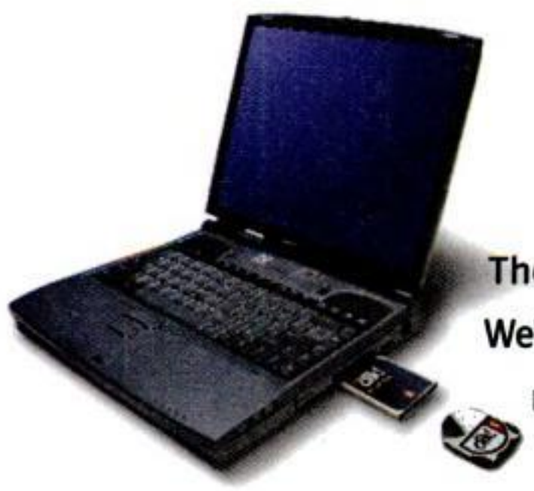


ACTUAL SIZE



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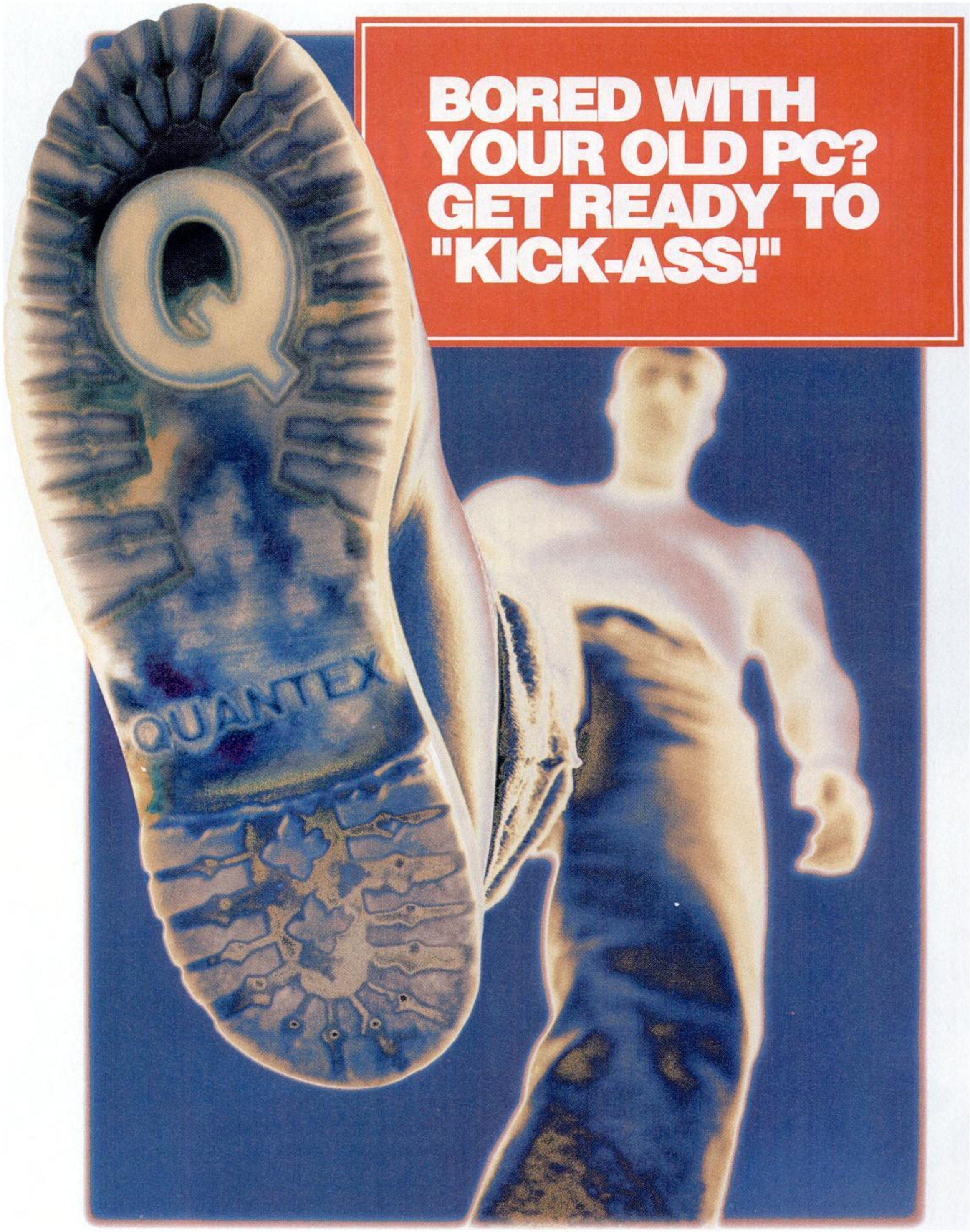
BORED WITH YOUR OLD PC? GET READY TO "KICK-ASS!"



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* Based on a July 99 Maximum PC Review. "Kick-Ass" awarded to GX550.

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CD-Rewriteable Drive
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Altec Lansing ACS-45.1 Speakers; Subwoofer
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Aureal Vortex2 PCI Sound, A3D 2.0 Technology
Game Titles-Battlezone, Heavy Gear, Interstate '76
MS Sidewinder Precision Pro Joystick
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3Dfx Voodoo3 3000 AGP Graphics w/16MB; TV-Out
Internal 100MB Zip Drive
6x Max Variable Speed DVD-ROM Drive
Aureal Vortex2 PCI Sound, A3D 2.0 Technology
Altec Lansing ACS-45.1 Speakers; Subwoofer
MS Windows 98 Second Edition
New Microsoft Office 2000 SBE
Optional Cannon MPC-3500 Printer, add $299

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3Dfx Voodoo3 2000 AGP Graphics w/16MB
40x Max Variable Speed CD-ROM Drive
Aureal Vortex2 PCI Sound, A3D 2.0 Technology
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COMM PORT

This month:

- How to win enemies and benchmark systems
- Saving your CPU from adver-SETI
- Packet writing and disc erasing explained
- We said no DVD SHAREWARE

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Letters from the Smartest Readers in the World

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This is Only a Test

Is there a program a person could take with them while shopping for a PC in order to check the speed? I'm not interested in anything too complicated, just a quick overall test.

— Jon Gallagher

Reviews Editor Rick Popko replies:
Jon, going into a store with your own benchmark CDs is generally frowned upon by retailers for two reasons:

1. You could bring harm to their machine accidentally.

2. They don't want you to see how slow their machine really is.

If you want to bring a CD into a store to test a machine, try using the Maximum CD that comes bundled with the magazine on the newsstand. On it, you'll find most of the benchmarks we use here. With that, you can compare the scores you get with the scores found in our magazine. But we suggest you get permission from the store manager first.

No More Mr. Nice Guy

When I learned Sony would offer music in the upcoming Microsoft music format, I was excited. Then I learned that the downloaded music would be "offered at prices comparable to those for CD singles sold in retail stores." This will spell doom for Sony's online music plans. The main reason people pirate music is the ridiculously inflated cost of CDs. The music industry defends its pricing, hiding behind distribution, packaging, and manufacturing costs. Most of the profit from a CD (around 70%, I think) goes back to the label, not the artist. If record labels want to put an end to the MP3 pirate movement, they have to play smarter. The price of a CD single is a joke. Six bucks or more for one or two songs? I'd pay $1 per song max. But I'm not willing to buy "packages" of songs—six songs for $6. I want to pick and choose what I buy. The days of buying an entire album for a couple of good songs must end. Many of the songs I've wanted to buy didn't even come out as a single. It was the whole album or nothing. These new music formats could be the end of that. But if the record labels get too greedy and lose money to MP3 pirates, that's fine by me.

— Mr. NiceGuy

Repetitive Stress Injury

I recently started to participate in the SETI@Home project. Although I'm extremely impressed with the project and its goals, I am concerned with the possible "overstress" of my CPUs while running the software. The application runs great, but both of my 450MHz Intel CPUs run at 100% capacity while it is processing a "packet" of downloaded data (I run NT 4.0 with dual processors and monitor CPU utilization with Task Manager). Could this overstress or overheat my computer?

I want to continue supporting the SETI effort, but I've started limiting my processing to one hour per day. Since the application is designed to run as a screen saver, if I could limit the time the screen saver is displayed and have it "rest" for an hour, I'd feel more comfortable!

— Chuck Wood

"I'm concerned with the possible 'overstress' of my CPUs while running SETI@Home."

News Editor Gordon Ung replies:
With adequate cooling, your CPUs should be fine. The SETI@Home project does indeed throttle both CPUs to 100% all the time, but it's not doing all you expect it to. Many NT4 users have complained that SETI@Home isn't the most efficient SMP execution, and you may not gain any advantage at all from dual-proc firing. Since SMP doesn't seem to do anything, you may want to set SETI to run on only one CPU. Under NT4 with SP5, go to Task Manager/Process and right-click on the SETI client. Pick "Affinity" and set it to either CPU 0 or 1. You may find your "CPU time" under dual to be the same as one CPU.

Wrappers Delight

When did it become a crime to interpret another language? Imagine someone arresting you for using an English-to-Spanish dictionary because it took away from the fluidity of the language. Absurd you say, and yet that is exactly what 3dfx is charging web sites such as Glide-Underground with. Somehow, it's illegal to make Glide calls through an interpreter in order to run in Direct3D. It's not like it's a big, involved process. Just make a DLL file and route all Glide commands to that file, then change the calls for a Direct3D, OpenGL, SGL, or other language.

3dfx says Glide wrappers are infringing on Glide as a language and 3dfx as a company, stealing profits. 3dfx should drop dead for its idiotic responses to the wrapper industry. If 3dfx is allowed to continue, it will

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drive away talent that could revolutionize the market, just like if Intel tried to stop chip makers such as AMD, Cyrix, and Centaur from producing x86 chips.

—Leggir

Terms of Enlightenment

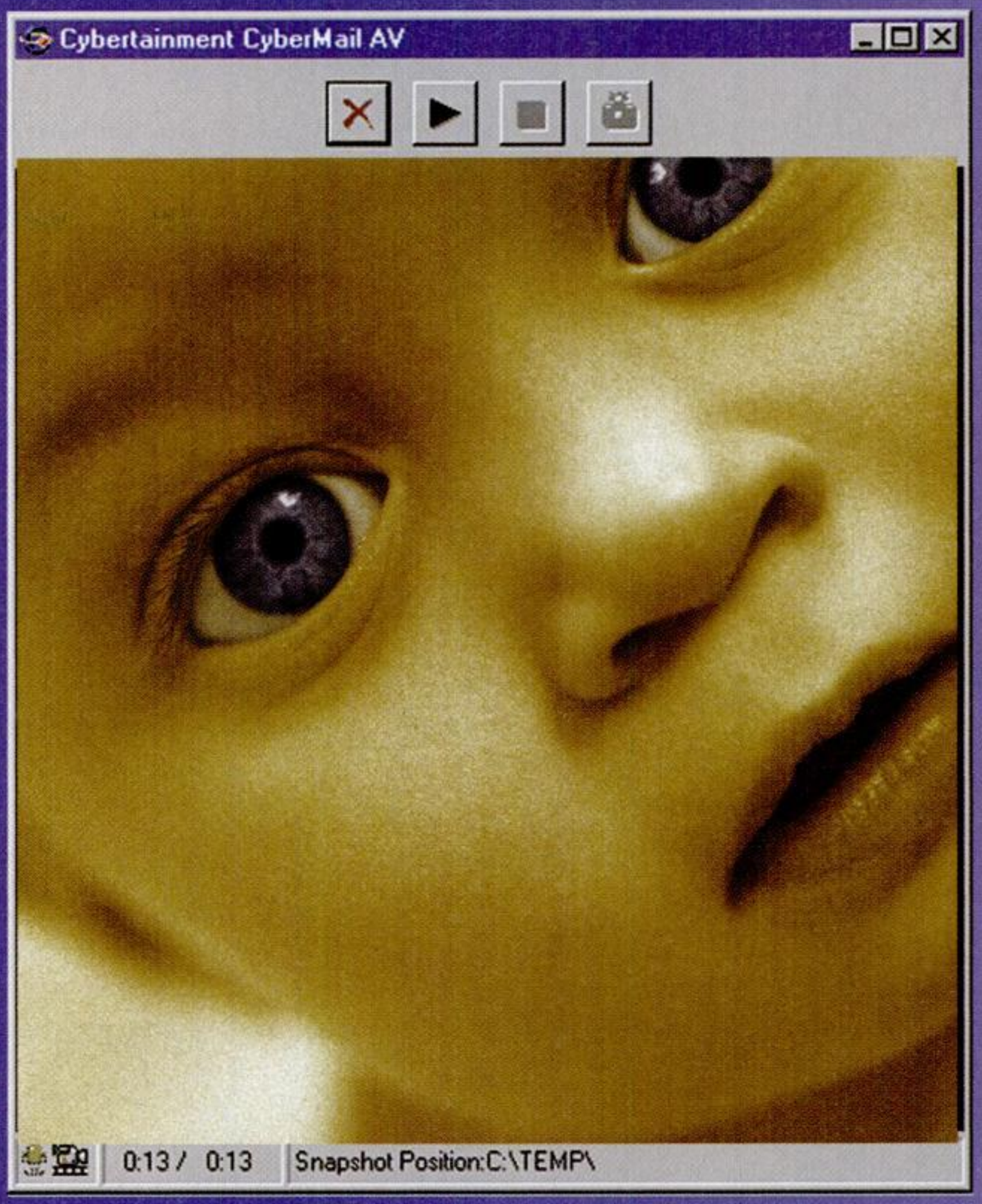
I recently purchased a Memorex CD-RW drive that doesn't support "packet writing." The Terminator says this is the opposite of disc-at-once and track-at-once, but I don't know what either of those terms means. It sounds like packet writing, at least the audio aspect, is the ability to have separate song tracks, as opposed to all the songs on one track. Am I right about this? If not, what exactly is packet writing, and what would I be missing out on by keeping this CD-RW or gain by buying another that does support packet writing? Also, I've heard that some audio CD-R discs can be played only in CD-RW or CD-R drives. Is this still true today?

— Nathaniel Daher

Technical Editor Sean Cleveland replies: It doesn't appear that Memorex *bundles* any packet-writing software with its CD-RW drivers. It only bundles NTI's *CD Maker Pro* and *Backup NOW!* software. A utility is included with NTI that allows CD-RW discs to be erased, but there is no mention of any packet-writing software. The drive, however, does *support* both variable- and fixed-length packet writing.

Packet writing is a method of writing data to discs in small increments at a time. Most packet-writing software, such as Adaptec's *DirectCD* and CeQuadrat's *PacketCD*, works with the Windows Explorer, giving you the ability to copy data to a CD-R or CD-RW as if it were a hard drive. With CD-RW, you can erase and reuse discs. If the packet-writing software supports fixed-length packets, data can be deleted and freed up for more. This is called "random erase," and packet sizes are all 32K in size. Variable-length packet writing, which was the original standard, does not support random erase, so data that's deleted is still on the disc and is not freed up. It's just removed from the table of contents.

Track-at-once is the data-writing method in which the CD software stops



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the laser after every track has been written (data or audio). For audio, this creates a two-to-three second gap between audio tracks.

Disc-at-once is a writing method for audio in which the laser is never turned off. This method is best for recording live music, when you don't want gaps between your music but each song is seen as a separate track by your player.

As for playing audio CD-R discs, this is actually a broader topic. Earlier CD-ROM drives were not multiread compatible. This means they couldn't read gold CD-R discs, rewritable CD-RW discs (with either fixed- or variable-length packets), or both. All new CD-ROM and DVD drives are multiread compatible. You should be wary of CD-ROM drives with speeds below 32x and DVD-ROM drives with speeds below 2x—they may not support the multiread spec.

A Snitch in Time

The flood of bogus software and hardware needs to be stopped, but I wish the pirated companies would do something to help those who were stiffed.

By all the signs in your "Fakes!" article (June 99), I have a bogus copy of Win98. I'd love to nail the guys who sold it to me, but let's be honest, Microsoft is anything but cool when these things happen. The last thing I want to do is let them know I'm running a bootleg copy of their OS. They're so piracy-phobic that I have visions of men in black jumpsuits carrying sledgehammers, rappelling out of helicopters to bludgeon my poor computer into submission.

Shelling out another hundred clams is not an option either.

In return for your bogus disc and all the info about when and where you bought it, Microsoft should sell a special edition of whatever was purchased for the price difference between the pirate and legit version. They'd get hard evidence to prosecute, and I'm not out more money. In short, everybody wins but the crooks.

— John

Eye of the Tiger

I just read your June issue and really liked the article on counterfeit products, "Spot the Imposters." I have one question: The article says Microsoft recovered 55,000 counterfeit *Office 97* CDs worth $55 million, so how come a single copy of *Office 97* costs $1,000?

Also, in your picture of six Microsoft serial mice, you say the second one from the left is genuine. I noticed its FCC ID number (C3KSMP1 vs. C3KSS1) and its name (mouse port compatible mouse 2.0a vs. Serial mouse 2.0a) are different from all others. Also, all other mice are labeled as manufactured in Taiwan while the second one from the left was labeled as manufactured in Mexico.

This makes me wonder if there are indeed different models of Microsoft Mouse 2.0a, especially since the FCC IDs are different (which normally indicates different parts).

— Terrence

News Editor Gordon Ung replies: Doh! It's a case of brain fade. *Office 97* actually costs a little less than a thousand; instead of $55 million, we should have reported $33 million.

The 2.0a mouse was indeed manufactured in different countries: Taiwan and Mexico. You should check the country of manufacture because some counterfeiters are too lazy to check the real thing, thus labeling some 2.0a mice as made in China. The best protection is to look for that Microsoft sticker on the mouse tail. If it has one that doesn't change color, look elsewhere.

"I have a bogus copy of Win98. I'd love to nail the guys who sold it to me."

Don't Blink

Tried your best to screw us by getting rid of the blinking lights in the **maximumpcmag.com** background, eh? Not smart enough for the smartest readers in the world, though, because we've outsmarted you this time. Muhahahahaha!

I was most annoyed when you decided to replace the blinking-light GIF with the static one. For those readers savvy enough to have saved the old 7K GIF (STEELBG.GIF), all you have to do is look in your cache directory for the new file. It'll have a strange filename, so use an image program that gives you a thumbnail view and browse all your 6K to 7K GIF files. When you find the right one, copy the filename. Paste the filename onto the 7K STEELBG.GIF and copy the file to your cache directory, replacing the static version. The next time you visit *Maximum PC*'s web site, the blinking lights will be back! And you can make the same GIF your Windows 98 wallpaper, since Windows 98 supports Active Desktops!

—Mark Miller

Editor in Chief Brad Dosland replies: Drat you, Mark Miller! You've foiled us again! Well, we might as well give in and provide the GIF to all those who choose to follow your insane plan. We'll post it on our web site in the Re:Print section so you can have your blinkin' page.

Mark of the Beast

In response to Sean Cleveland's comment in the June 99 Comm Port that "there's no such beast" as a shareware DVD software decoder, I beg to differ. I'm using a $49 Diamond 2000 SVGA/PCI card on my system and get great results with Cyberlink's *Power DVD*. It's the best all-around software-only solution for DVD, in my opinion.

— Dave

Technical Editor Sean Cleveland replies: We downloaded CyberLink's 30-day "trial version" of *PowerDVD* and checked it out. Very impressive visual quality. In fact, the player has more controls and features than most. System requirements are a Pentium II 266MHz or higher with at least 16MB of RAM. Not bad. We will definitely look into this further. But I still stick to my claim, "there's no such beast." This is not shareware. The trial version does indeed last for 30 days, but it also only lets you play up to three minutes of audio and six minutes of video at each startup. For the full version, you need to pay $49.

Hire a Hacker

Hey, I have a great idea: a hacking game. I'm not talking 3D polygon-pumping, bump-mapped madness. Rather, give one team of hackers a server that they have two hours to configure against attacks, and the other team gets to try everything in their hacking arsenal to get the information/admin-password from the server.

Some may argue that this will only encourage hacking. I'd argue that it's never going to go away, so why not encourage some expertise on the preventative side while providing an outlet for the other energy? Most of these hackers are destined

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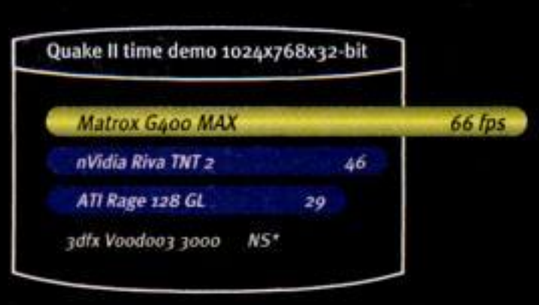

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to become highly paid programmers and database admins, so why snub them? They're just doing what they do best.

And can't you just see it... "The defensive winners of today's hacker tournament will receive 10-year contracts with _____ [fill in your own company]." It'd be better to have a hacker on your side than be the victim of one. Why crush intellect when you could harness it? We commend George Lucas for doing what he does best. We praise Nobel Prize winners for advancements in their field. Why deny this social acceptance to intelligent individuals who can't find another outlet for their "talent"?

—CompileMonkey

Intel Bounces Back

No people, Intel did not screw up. I'm talking to all the people who think Intel shot itself in the foot by making the Celerons as good as (and in some benchmarks, better than) the Pentium II.

Newsflash: Intel knew exactly what it was doing.

I believe Intel saw the handwriting on the wall for the P-II as soon as AMD announced the K6-III. Intel knew the K6-III 450 with its 256K built-in cache would whoop ass on the Pentuim II series. And that AMD would sell it for less than a comparable Pentium II. Heck, I've read tests that say it gives the P-III 500 a run for its money. Intel had to capture the low-end-but-still-good-performance market or suffer major losses. Thus, the Celeron A was conceived. It's obvious to me that Intel decided to completely abandon the once-top P-II. As you see the prices dropping radically, the reason is clear: Retailers can barely give P-IIs away. So all you people who think you're getting one over on Intel, think again. Those execs are laughing their asses off.

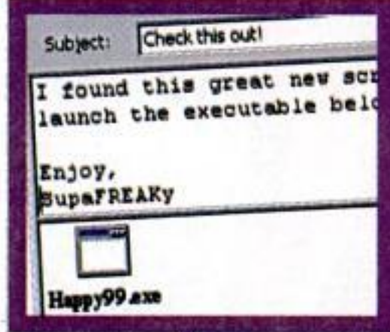
— Kevin S.

Sale on Cookies at Costco

Something happened to me online recently that should be exposed to the public. My browser is set to reject cookies as a matter of course, but the costco.com site literally rejects you if you refuse their stupid cookies. You get a very long explanation of why they "must" put cookies into your computer. When I talked with the local store manager, he did not even understand what I was talking about, nor would he give a number to talk with someone who would. So no shopping at Costco for me!

— Lon Smith

News Editor Gordon Ung replies:
Those cookies are fattening. Unfortunately, the trend in every web site in the world, even our own, is to use cookies. Web sites that use them know our own laziness will eventually force us to comply, too. It's just too danged easy to let the Amazon.com cookie exist rather than typing in information every time you want to buy a book. Your response is the best answer though: Don't patronize those who don't respect your privacy. ✹



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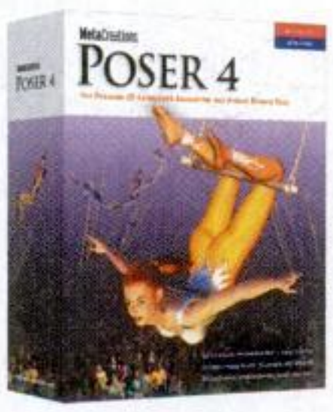

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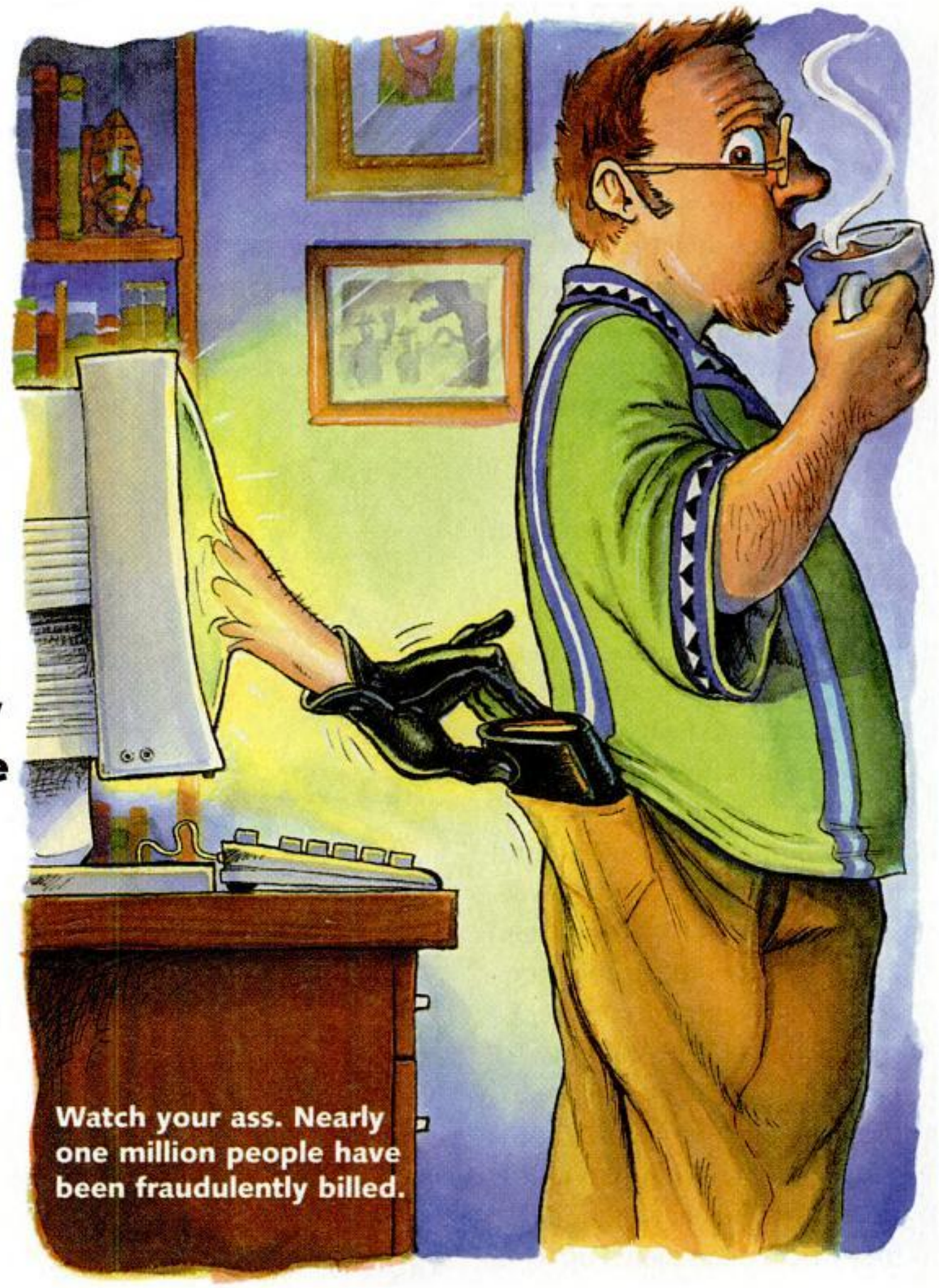
Consumers Bilked for $49 Million

Check your credit card; "Internet Service" scam ripped off nearly one million people



John Faughnan didn't notice the $19.95 ding on his credit-card bill until November 1998. Checking his previous bills, Faughnan discovered he'd been getting billed by a mysterious merchant since June 1998.

"Early on, I guessed [the scam] was pretty big," Faughnan told *Maximum PC* from his Minnesota home. But he didn't have any idea how large it was.

Three months of investigation later, the physician and software developer found he was in the middle of what may be the largest credit-card scam in history—an estimated 900,000 consumers were billed $49 million in services they never ordered. The alleged scam also highlights what may be a growing problem with Internet sales and the current credit-card system.

According to federal officials, at the center of it all was a Southern California businessman with a colorful history in porn, herbal goods, and the pastime that ultimately landed him in the clink—credit-card processing.

Authorities say that under the names Netfill, J.K. Publications, MJD Service Corp., and N-Bill, Kenneth Taves, a.k.a. Ken Till, masterminded a scheme to defraud consumers of services they never asked for. In some cases, consumers were billed for Internet "services" even though they didn't own computers.

While Taves sits in a Los Angeles jail cell awaiting trial on charges of lying to the Federal Trade Commission, lawyers are trying to piece together what's left of the $49 million. Authorities have already confiscated Taves's $2.2 million Malibu beach house, $6.2 million in a Cayman Islands bank account, and a few hundred thousand dollars accumulated in other bank accounts.

"We're not done hunting," says Doug Wolfe, an attorney with the FTC's Division of Marketing Practices.

FTC officials say the scam worked this way: Acting as credit-card processors for small-scale adult web sites, Taves and company allegedly illegally obtained consumers' credit- or debit-card numbers and billed them for either porn or generic Internet services. Consumers' bills sometimes showed 800 numbers for the merchant that

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SPIN CYCLE

This month's top stories ►

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Divx Is Dead	Divx, the much-maligned competitor to DVD, is dead. Only 90,000 units of the technology were sold compared to more than 1.2 million regular DVD units.	Its creator, Digital Video Express, and Circuit City pulled the plug in late June. Customers who bought units prior to June 19, 1999, were offered $100 rebates.	"Unfortunately, we have been unable to obtain adequate support from studios and other retailers," said Richard Sharp, CEO of both companies.	Frankly, we're surprised Divx lasted as long as it did. The question is, Will those 90,000 customers actually receive rebates? The Dog is watching.
PlayStation 2 Under Government Scrutiny	The U.S. government may restrict overseas sales of the PlayStation 2, as its chips may "warrant export control under the definition of high-performance computers."	Legislators believe the chip—which Sony alleges will be about three times as powerful as the Pentium III—could be used for nefarious purposes.	"We certainly have to look at this product closely," said Commerce Undersecretary William A. Reinsch.	Gee... we had no idea that the PlayStation 2 was so powerful. We wonder when PC technology will finally catch up.

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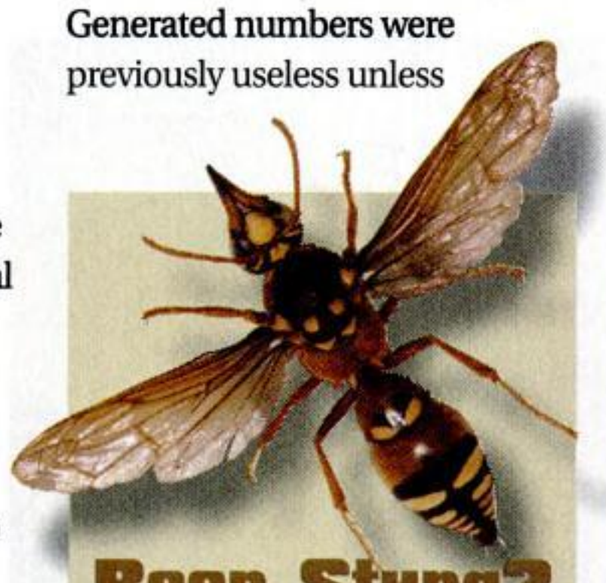
billed them. When consumers called the number to contest the charge, they were given endless voice mail trees, or referred to mail drops and web sites that went nowhere.

Still a mystery is the question of where the companies obtained the numbers. The FTC believes the numbers were either stolen through traditional credit theft means or—more troubling—Taves, et al., simply used credit-card number generators to create the numbers.

According to Faughnan, who spent months investigating the problem and communicating with hundreds of victims around the world on his web site (**www.labmed.umn.edu/~john/ccfraud.html**), credit-card numbers are generated using a simple checksum algorithm. Programs to create the numbers are easily found on the Internet. In some cases, the bogus numbers didn't go through, but when they did, they would often match up to existing debit- or credit-card accounts that had been issued to people. That's how people who never owned a computer were dinged for services. Because the same algorithm is used legitimately to create and assign credit- and debit-card numbers around the world, Faughnan says, the illegal charges were spread internationally. He's talked with victims from Japan to the U.K. who were repeatedly dinged in the scheme.

Overall, it makes for an insecure system that's been amplified by the anonymity of e-commerce transactions selling ephemeral services such as porn. Generated numbers were previously useless unless you could put them on a credit card, and buying physical goods through mail-order left a paper trail cops could follow.



Been Stung?

Get in line. A study by the National Consumers League shows six million Americans report they were victims of credit-card fraud on the Internet.

Even if your bank covers you on credit-card fraud for only 60 days, it's worth checking your bills from 1998 to see if you've been dinged by these companies:

- **Netfill**
- **J.K. Publications**
- **MJD Service Corp.**
- **Online Billing**
- **N-Bill**
- **Net Options, Inc.**
- **Webtel**

If your bill shows charges from the above companies, you might want to contact the FTC at 877.382.4357.

"As long as 90% of people don't notice the charges are illegitimate, the (scammers) and the credit-card companies make their money."
—John Faughnan, Software Developer

"The people in the credit-card industry have known about these things for years," Faughnan says. "But the biggest problem is that there's a huge amount of software involved. To put in a PIN or use expiration dates would cost the credit-card industry a lot of money."

Because it's cheaper to eat the $49 million than fix the entire system, companies such as Visa and MasterCard simply let it continue, Faughnan charges. And there's another incentive.

"As long as 90% of people don't notice the charges are illegitimate, the (scammers) *and* the credit-card companies make their money. There isn't a huge incentive to fix it."

Visa and MasterCard officials declined to speak about the security built around credit and debit numbers, but did issue a statement saying that incidences of credit-card fraud have decreased in recent years. Visa also says debit-card customers' liability is limited to zero if the charge is reported within two days of discovering the fraud.

There won't be any more charges coming from N-Bill, though. In January, the FTC lowered the boom and accused Taves, his wife, two other Californians, and eight companies they ran of misusing consumers' cards. The FTC was granted an injunction to halt the companies' credit-card transactions, and froze the assets of Taves, et al.

Ken Taves's attorney declined to comment for his client, although his previous attorney has stated that Taves was simply processing credit cards for other sites that received the bogus or stolen accounts. No go, Wolfe says. If that's true, why couldn't Taves produce contracts or documentation to show what the other sites were?

"We certainly believe that Taves was at the heart of what was going on here," Wolfe says.

When the FTC is finished rounding up cash, it'll be dispersed to consumers who have filed complaints, but thus far, only a few hundred have complained, Wolfe says.

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SPIN CYCLE

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Rio Ruled Legal	A federal appeals court has ruled that Diamond Multimedia's portable MP3 music player does not fall under a rule restricting digital recorders.	The Recording Industry Association of America tried to halt Rio sales, arguing that copying files to the MP3 player was tantamount to recording. Judges disagreed.	"We filed this lawsuit because unchecked piracy on the Internet threatens the development of a legitimate marketplace for online music," a RIAA statement said.	Let the music begin. You can't stop change with lawsuits. Innovate or get out of the way.
3dfx vs. Creative Labs, Fight!	A full-on fistfight is brewing between former partners 3dfx and Creative Labs.	Creative released a driver allowing 3dfx-only games to work on Creative's boards. So 3dfx sued Creative. Then Creative released a driver making 3dfx cards run better.	"What we're trying to do is avoid getting the end users caught up in the mess," said Creative Labs' Jim Carlton.	Is Creative trying to pee on 3dfx's parade? We don't know, but if consumers benefit from it, who can argue?

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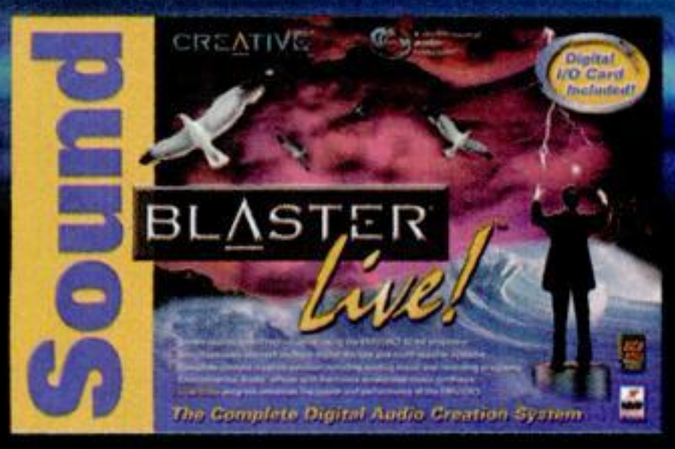

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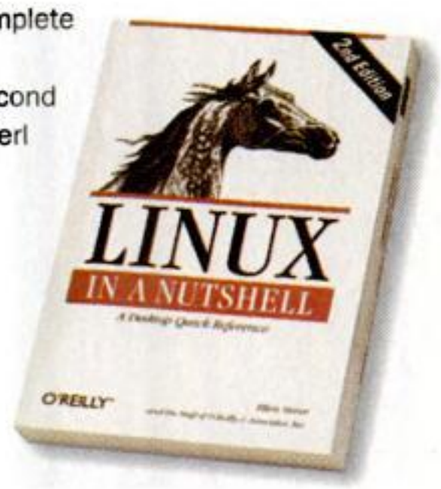

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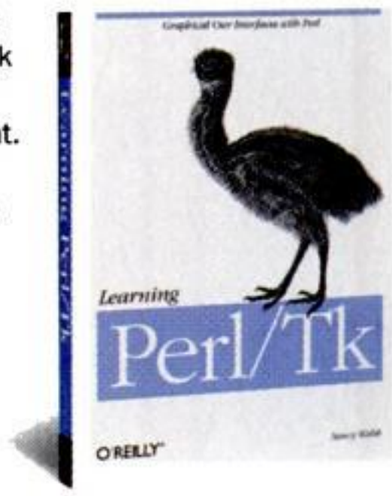

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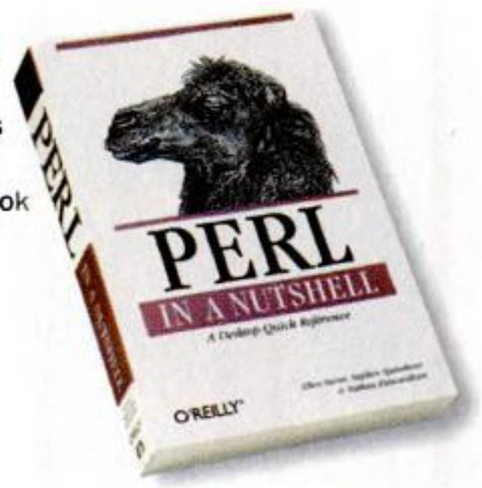

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▶ Maximum PC takes a bite out of bad service and gear

WATCHDOG

This month:

- NewCom disappears
- Sony's CD kit mystifies
- All I wanted was a port!

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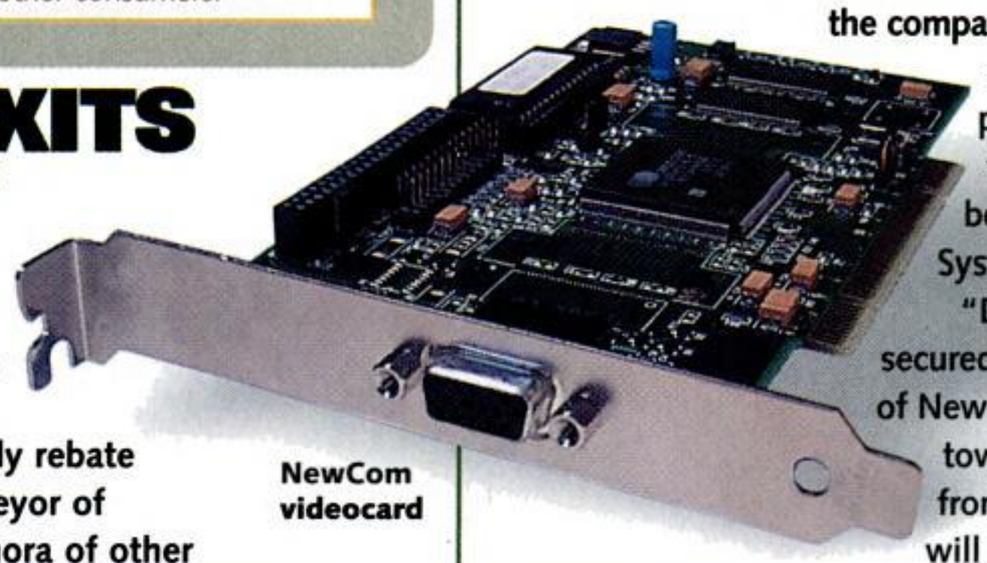
NEWCOM EXITS STAGE LEFT

There are rebates from hell, and there are rebates from NewCom. For months, **THE DOG** has received complaints about shoddy rebate service from NewCom Inc., purveyor of modems, CD-ROMs, and a plethora of other computer products under the name Atlas Peripherals. NewCom's products were sold via nationwide computer store chains such as Best Buy and Office Max.



NewCom videocard

In an interview with The Dog earlier this year, Bob Spector, NewCom's Director of Marketing, said the company was moving away from rebates because of the headaches they caused, and that many of the problems NewCom customers had experienced were related to an ill-equipped rebate fulfillment center in Arizona the company used.

According to an attorney who filed a class-action suit against NewCom last year, it isn't a question of who didn't receive a rebate check—it's a question of who did.

"We know of 200,000 [customers] that should have gotten rebates," attorney Peter Macuga told The Dog. "And we've been told that there were about 10,000 who were paid rebates." Sounds like NewCom was using an unfulfillment center.

Spector claimed the errant fulfillment house had issued checks that looked like postcards, and that many were either tossed out by consumers who thought they were junk mail or destroyed by the post office, which has a statistically higher probability of tearing postcards than letters. Spector also said that NewCom was getting a handle on the rebate issue and expected the whole problem to go away.

Instead, it looks like NewCom went away. Macuga said the company was about to sign a settlement and address the case of the missing rebates when the whole deal went sideways.

"On the day the preliminary settlement agreement was to be entered, NewCom fired its lawyers and told the court they would not enter into the settlement agreement. Then the company laid off all of its employees," Macuga said.

Those searching NewCom's web site for information about their past-due rebates find this message: "Due to a variety of reasons, the rebate situation is a problem for all concerned. Unfortunately, we are currently involved in pending litigation on the rebate issue. As such, we are not allowed to comment on rebates at this time. We apologize for the inconvenience this issue has caused and hope to be able to provide you with more complete information shortly. Thank you."

What's the story on NewCom? Based on a press release the company put out after the other shoe dropped, things look pretty grim. NewCom claims to have shuttered its doors because Deutsche Financial Systems cut off its credit.

"DFS, in its capacity as a secured lender, has taken possession of NewCom's inventory with a view towards its liquidation. Proceeds from the sale of the inventory will be used to satisfy the Company's indebtedness to DFS, which is estimated to be in excess of $8 million. DFS has also instituted legal proceedings against NewCom to collect any remaining outstanding balance owed by NewCom to DFS under the credit line. Efforts are continuing to restructure the business and capital structure of NewCom. Such a restructuring may involve discontinuing NewCom's traditional computer peripherals business and engaging in a new line of business."

"DFS has taken possession of NewCom's inventory with a view towards its liquidation. Proceeds from the sale of the inventory will be used to satisfy the Company's indebtedness to DFS."

The end result for consumers who are owed rebates? It's likely they will never see a penny from NewCom, because the company's main creditor will suck every cent from the carcass first.

Does that mean you're SOL if you're owed a NewCom rebate? Not if Macuga can help it. He said he's prepared to sue the stores—including Best Buy, Office Max, Staples, and Circuit City—that sold consumers NewCom products.

"The [stores] were withholding payments to NewCom to either ensure or force NewCom to pay the rebates," Macuga said. Although class-action suits normally don't require consumers to register as claimants, Macuga said he's asking anyone who has the receipt for a NewCom product and still hasn't received a rebate to contact his Detroit-based law firm. Macuga asked those customers to fax him at 313-965-2829 with copies of the receipts and their contact information, or to mail the information to Suite 1520, Ford Building, 615 Griswold St., Detroit, MI 48226.

Should NewCom restructure and offer a noncomputer product, **THE DOG** has an easy recommendation: Avoid it like the plague. Consider NewCom and Atlas Peripherals confined to **THE DOGHOUSE** for two consecutive lifetimes, with no chance of parole. Aroof.

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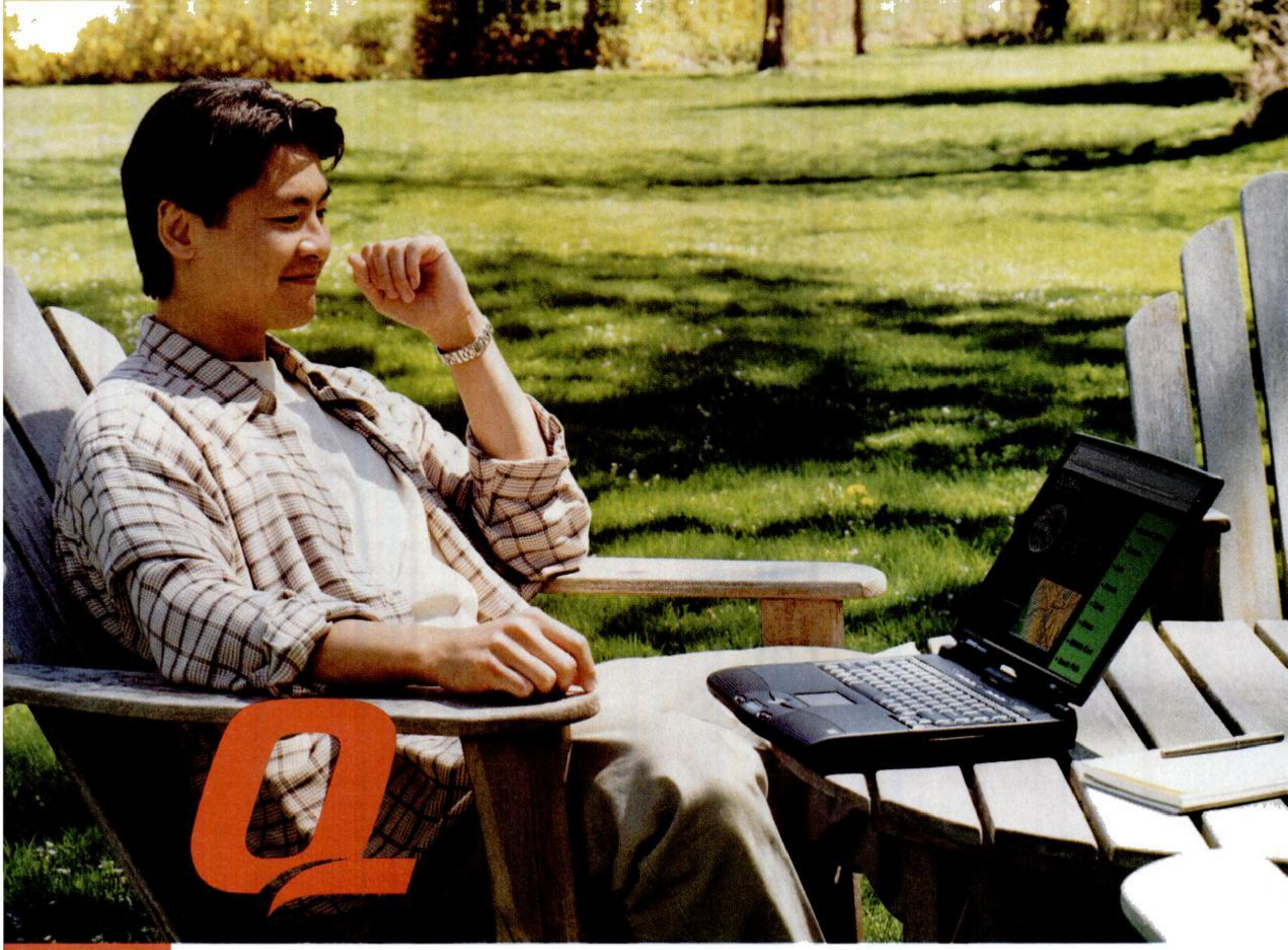

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LAB NOTES

► REPORTS FROM THE FRONT LINES OF TESTING

During all our hours spent in the lab evaluating components, we learn a whole mess of bug fixes. Sometimes we discover the work-arounds ourselves. Other times we call the offending vendor and say, "Yo, Joey, your part doesn't work! You gotta fix, or what?" And then the vendor, duly alerted to his product's less-than-stellar reliability, walks us through the correction process.

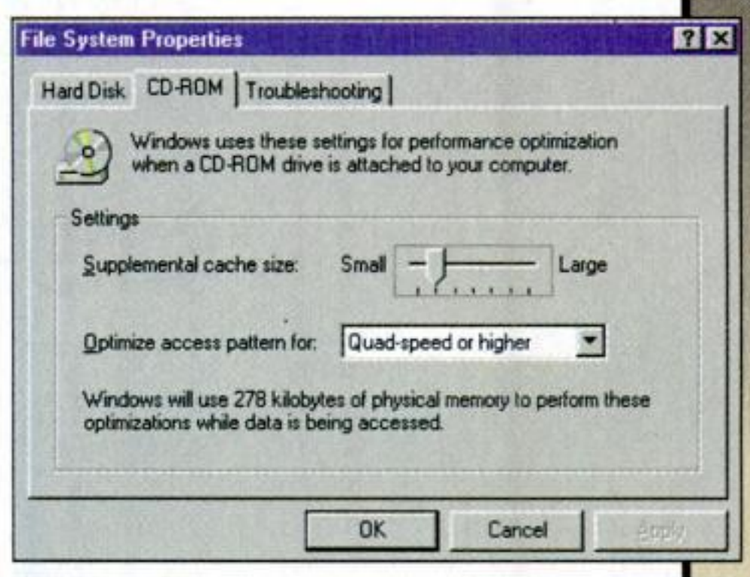
Yes indeedy, hands-on testing can lend a lot of troubleshooting insight. Here's some highlights of what we discovered this month.

Dazed and Confused

We've found that some BIOSes (especially those in Micron machines) can become confused after multiple hard drives have been swapped in and out. The symptoms are detectable during bootup: It will take a long time for the boot partition to be recognized, resulting in a long delay before Windows actually begins loading. In acute cases, the machine can't see the drive or boot partition, resulting in an error message that indicates the drive is not detectable, or a bootable drive cannot be located.

You can address the problem by reloading the Setup Defaults within the BIOS itself. The BIOS can be entered after you've first powered on by hitting either Delete or the F2 key when instructed. Once in the BIOS, search for the "Load Setup Defaults" section (it's usually located in the same area from which you save and exit). Now load the Setup defaults and choose to reset the BIOS with these settings. You may need to manually re-enable USB support or disable onboard sound if you use a separate soundcard.

Shut down? Who ever shuts down?



Having a problem with Windows shutting down improperly? This can indicate a problem with the flushing of the CD-ROM cache. Luckily, there's a simple fix for those who haven't seen their shutdown screen in a long time. All you need to do is decrease the supplemental cache size from within System Properties. Just right-click on My Computer, select the Performance tab, and then click the File System button on the bottom-left corner. Select CD-ROM and then slide the Supplemental Cache Size slider to Small. This will also increase your CD-ROM performance by decreasing your CD-ROM drive's overhead, especially when copying files. The only time the CD-ROM cache does any good is when you're repeatedly reading database-type info of a small nature.

It's therapy, not a cure

Microsoft has published an article that provides info on troubleshooting Windows protection errors. These nasty errors are caused by a glitch that occurs while loading a virtual device driver (VxD), a low-level driver that enables communication between hardware devices and memory. VxDs perform specialized functions outside of Windows' programming interfaces. You know your VxD is unhappy when the screen turns black and reports "Windows Protection Error," but no actual helpful info is displayed. Microsoft's article can be found at **http://support.microsoft.com/support/kb/articles/q149/9/62.asp**. It contains detailed steps and troubleshooting for both Windows 95 and 98.

Ewww! I've mucked up me AGP card!

If you've hosed the BIOS on your AGP videocard while updating its firmware, there is a cure. All it requires is a PCI videocard (any will do). Keep your AGP card in the machine, install the PCI videocard, and connect your monitor to it. You will now be able to boot your machine. Then simply rerun the firmware upgrade for the AGP card, following the directions closely. We recommend booting clean off a floppy prior to running the BIOS update. Then remove the PCI videocard and reconnect the monitor to test for success.

Over drives beckons the goth

Hi-Val found that in some systems with co-habitating DVD-ROM and Ultra DMA CD-ROM drives, or in systems with DVD-ROM and CD-R/RW drives, there are crash issues during playback of DVD movies or duplication of CD-ROMs. The root cause is a file in your Windows\System\Iosubsys folder called SCSI1HLP.VXD. The issue is resolved by renaming (but not deleting) the file to SCSI1HLP.OLD. WARNING: Do not do this if you use an older SCSI-1 hard drive with a 40-pin connector.

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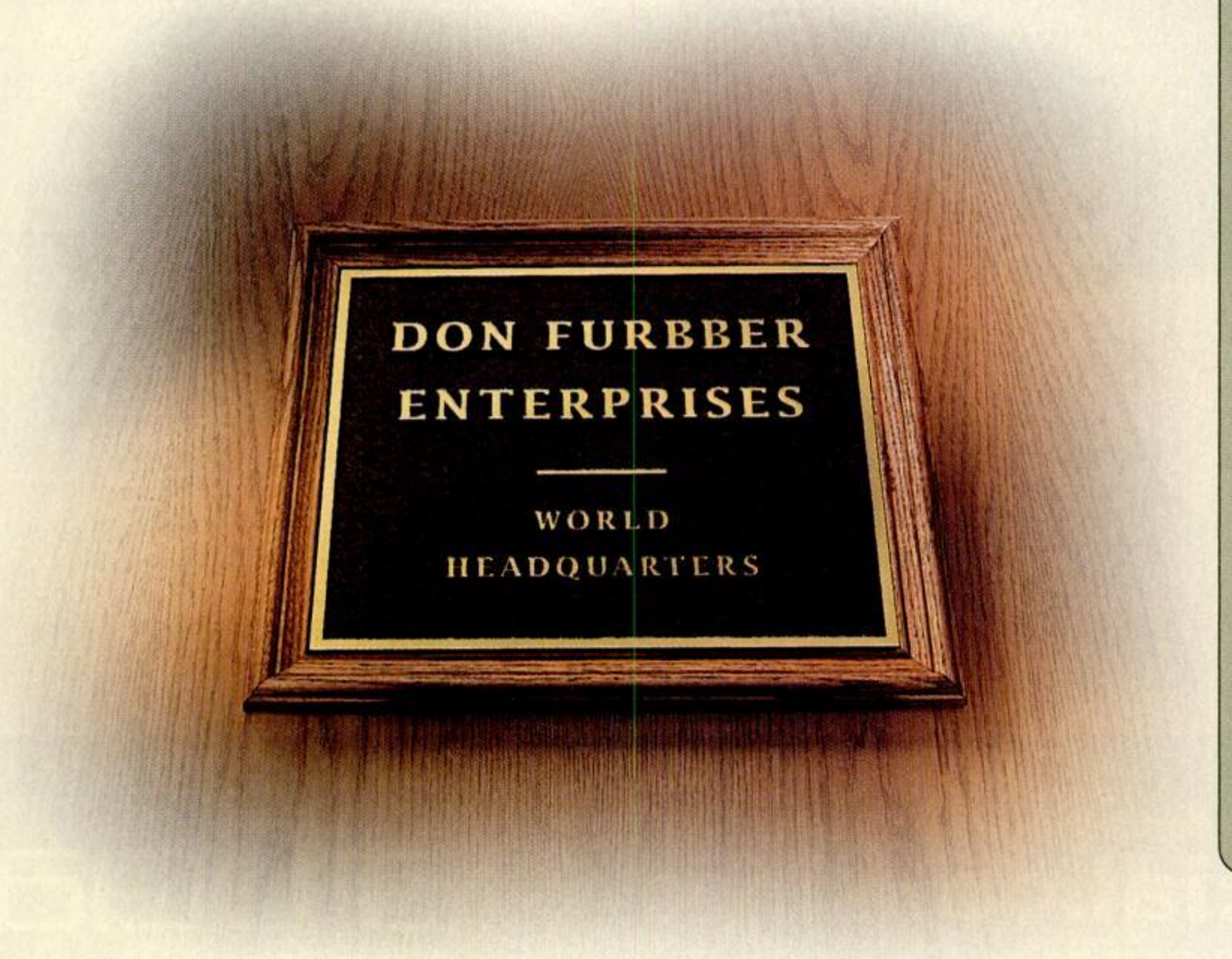

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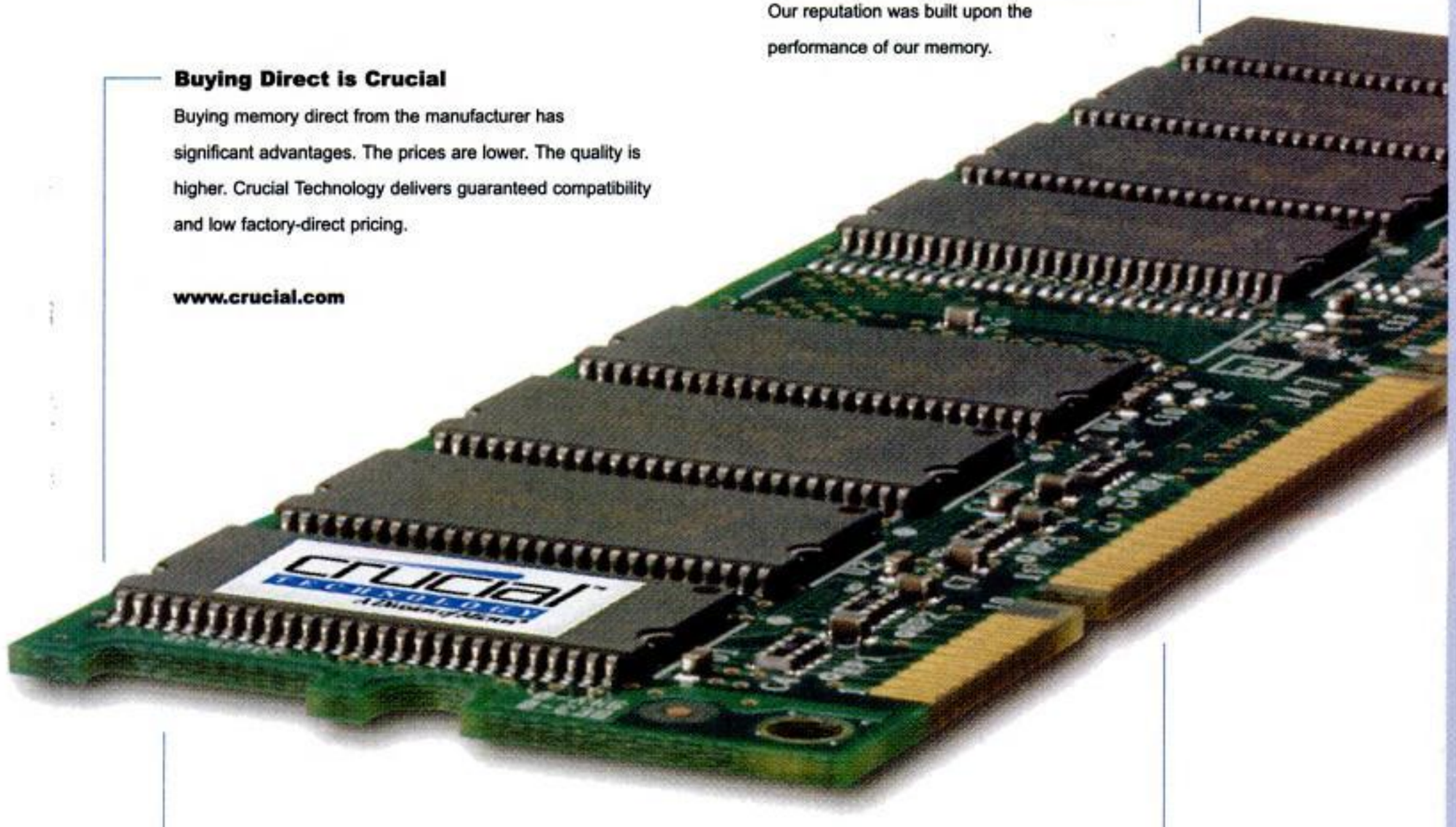

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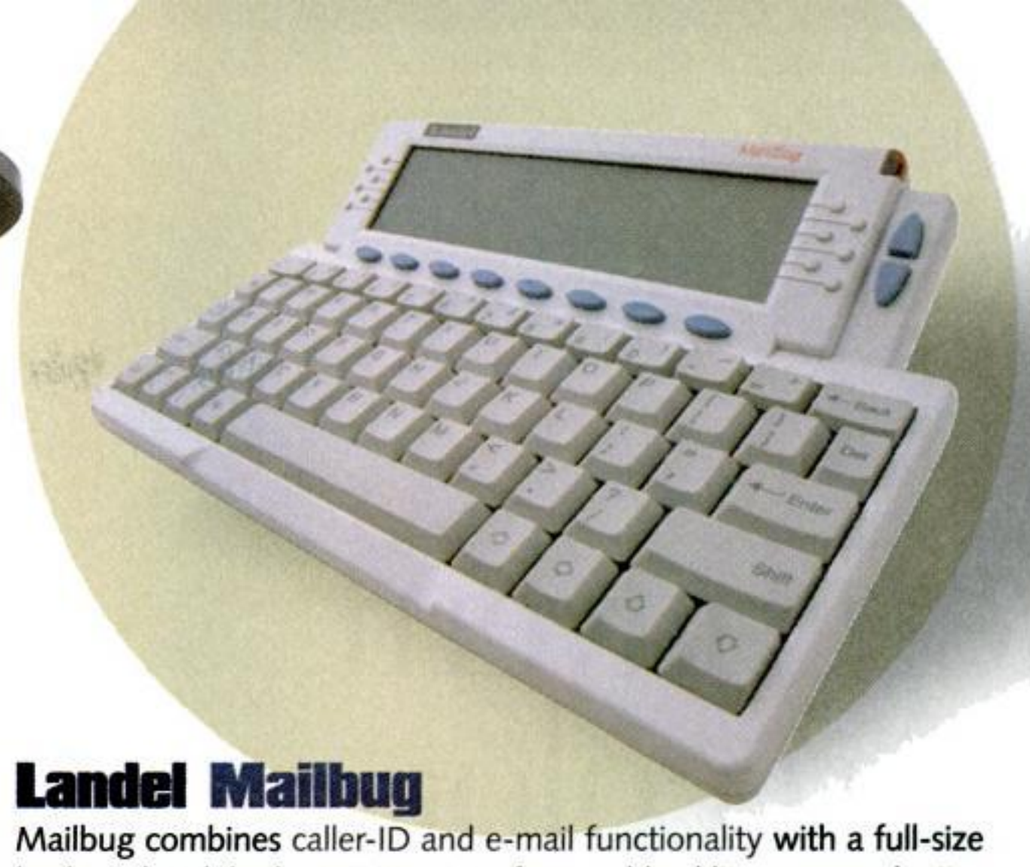

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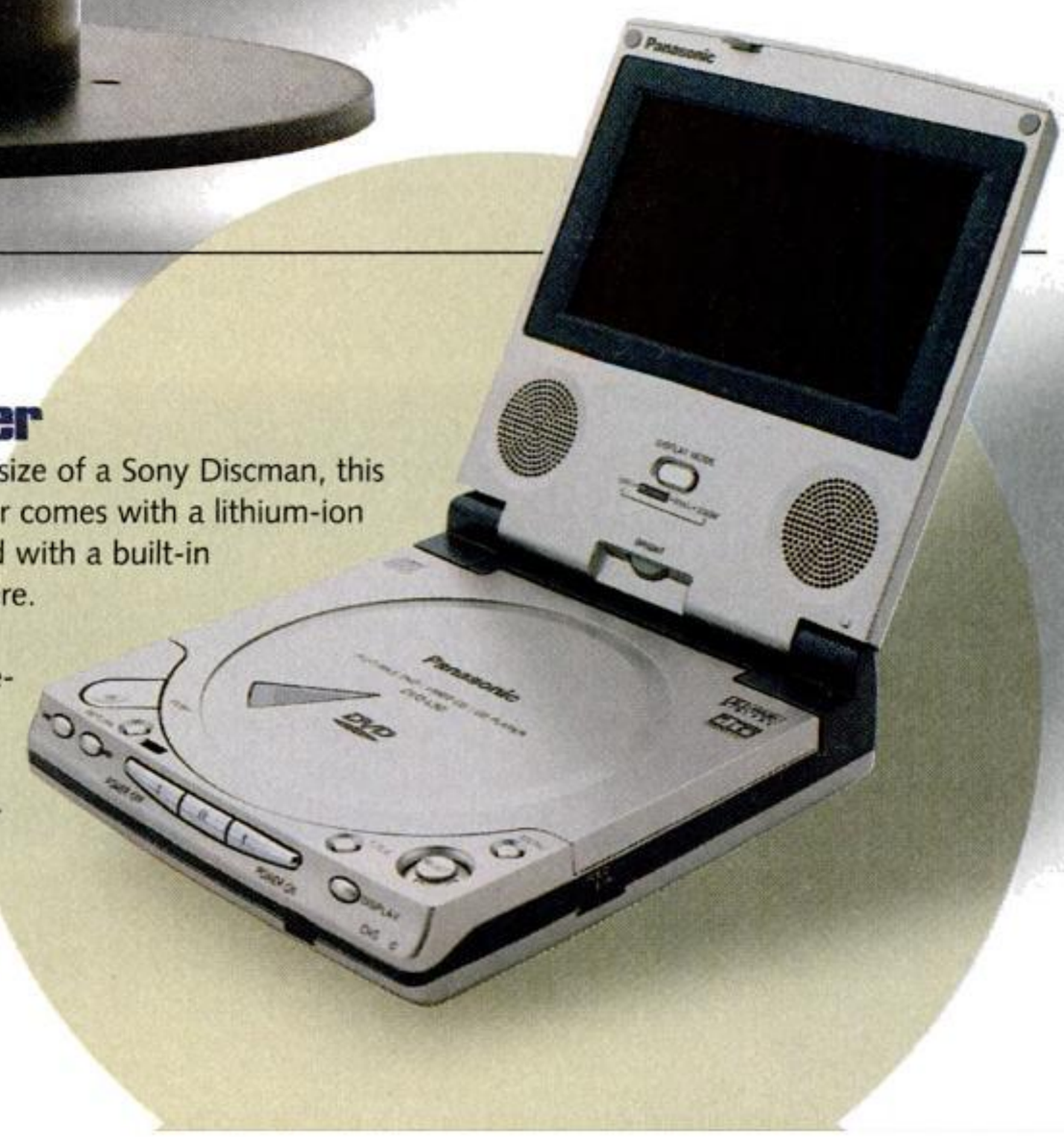

Panasonic DVD-L50 Palm Theater

The DVD-L50 is a must for all frequent travelers. Roughly the size of a Sony Discman, this lightweight (about 2 lbs with the battery), portable DVD player comes with a lithium-ion battery that'll run for up to three hours on a single charge, and with a built-in 5-inch color LCD so you can watch your favorite discs anywhere.

Beyond mobile movies, the L50 hooks up to a TV for big-screen action (4:3 and 16:9 aspect ratios), complete with a wireless remote. The only disappointment is that the L50 simulates surround-sound audio instead of true AC-3. But it still beats watching *Vegas Vacation* (again) on those cross-country flights.

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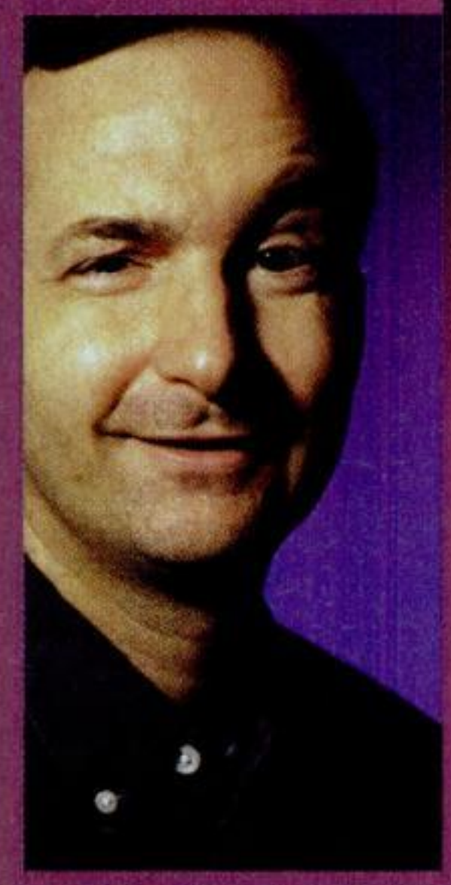

TOM HALFHILL
was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com**.

CPU Speed Limits

SOLVING TRAFFIC JAMS BY ADDING MORE LANES

Parallel lines may never converge, but CPU engineers are converging on parallelism. And lately their favorite way to get there is a technology called Very Long Instruction Words (VLIW). It's the basis for Intel's next-gen CPU—the IA-64. Marketing folks claim VLIW is the next leap "beyond RISC."

In this context, "parallelism" refers to a microprocessor's ability to simultaneously execute multiple instructions. Without this, performance gains would only come from higher clock speeds, larger caches, and faster access to memory (such as boosting the system-bus frequency).

Consider clock speeds. A 400MHz processor is twice as fast as a processor of the same family running at 200MHz. To double the performance again, a processor would have to run at 800MHz, then 1600MHz, then 3200MHz, and so on. But you can't keep cranking up the clock frequency without burning out the circuits, any more than you can rev your car engine to 10,000rpm without throwing a piston.

That's why all modern high-performance CPUs combine high clock speeds with superscalar execution (the ability to carry out multiple instructions simultaneously). If two processors of the same family both run at 400MHz, but one of them has a two-way superscalar core, then the two-way chip should be twice as fast.

Notice I said "should be" twice as fast. There's a catch. It turns out that designing a CPU that can execute two, three, four, or even more instructions at once yields a diminishing rate of return. Intel's Pentium Pro, Pentium II, Pentium III, Celeron, and Xeon processors all share the same basic internal architecture—a three-way superscalar core. But when running real-world software, they're lucky to average somewhere between one and two instructions per clock cycle. Today's technology would easily allow Intel to design a new four-, five-, or six-way superscalar core, but the relatively small amount of extra performance it would deliver hardly seems worth the effort. Instead, Intel boosts the clock speeds, adds more cache, and raises the frequency of the system bus. (New extensions such as MMX and SSE allow a CPU to do more work per clock cycle—a form of parallelism—but only when a program uses those special instructions.)

The problem with wide superscalar cores is that most programs just don't lend themselves to parallel execution. Two or more instructions can't execute at the same time if they need each other's results. Consider a spreadsheet that tallies annual sales by adding together all monthly sales. Obviously, the instructions that calculate the annual sum can't execute until the instructions that calculate the monthly sums are finished. This is called a "data dependency," and real-world programs are filled with them.

In other cases, a CPU can't execute multiple instructions simultaneously because it runs out of internal resources such as function units or registers. VLIW tries to fix this. First, the CPU architects design a simplified chip by removing the complex control circuitry that tries to figure out which instructions can execute in parallel without dependencies, shifting that burden to the compilers programmers use to write software. The transistors saved by eliminating the control circuitry are devoted to additional internal resources (function units and registers). In the end, a VLIW processor may have just as many transistors as a conventional RISC or CISC processor, but the transistors are (theoretically) put to better use.

Intel's IA-64 is based on VLIW, but it's hardly unique. Specialized media processors such as the Philips Trimedia and the Equator MAP1000 also use VLIW, and so do the latest high-end DSP architectures from Texas Instruments, StarCore (a Lucent-Motorola partnership), and Analog Devices. It's a genuine trend.

But nobody's proven that VLIW makes sense for general-purpose PCs and servers. It's easy for a computer-science student to write a highly parallel program that runs like a bat out of hell on a university VLIW simulator. It's not so easy to create a compiler that does the same thing for programs as varied as *Quake*, *Excel*, *Photoshop*, *Communicator*, and *SQL Server*. Ominously, the two companies that pioneered VLIW—Cydrome and Multiflow—aren't exactly household names, mainly because they crashed and burned (albeit for business, as well as technical, reasons).

VLIW makes more sense for DSPs because they perform repetitive operations on large data sets. That kind of software is highly parallel. To the extent that PCs run similar code, such as multimedia software, VLIW could make a big difference. But chipheads all over the world can't wait to see if Merced (the first IA-64 chip) successfully brings VLIW into the mainstream, or if it ends up in a parallel universe. ✸

You can't keep cranking up clock frequency without burning out the circuits, any more than you can rev your car engine to 10,000rpm without throwing a piston.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpcmag.com.

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ON THE LINE

Turn Your Head and Click

ONLINE HEALTH RESOURCES ARE SPREADING LIKE THE PLAGUE

Finding quality health information online may take longer than finding a good doctor in the yellow pages. And it's not that there isn't an abundance of health resources online, in fact there may be *too many.*

Since Jupiter Communications predicted that online consumer health would be valued at $1.7 billion by 2003, the web's gone berserk with health sites. It's one of the key "verticals," up there with sports, finance, and travel.

Are we getting sicker, requiring more health services, convenience, and advice? Or is all the service, convenience, and advice making us sicker?

Sites such as Healthon, (**www.healthon .com**), founded by Jim Clark in 1996, have known all along that getting the kids onboard now will build customers for the future, while players such as Yahoo! and MSN have just now gotten their feet wet with **health.yahoo.com** and **health.msn .com**. These are only portals, of course. Other dandy health portals: **adam.com** (What up with the blue-haired man on the front page? Is that Adam? Who's Adam?), **onhealth.com**, and **excite.com/health** (yawn...).

But with their recent merger, Healthon and the veteran WebMD (**www.webmd .com**) have gone leaps and bounds beyond the usefulness of a portal with drug references, encyclopedias, and health-advice "experts" (like I'm really gonna trust a mechanical database to field my health requests!). Healthon and WebMD are *actually* service providers.

Healthon allows healthcare providers to communicate with one another, offers quick access to clinical and administrative information, and facilitates transactions to smooth out payment and reimbursement issues. WebMD targets physicians with news, reference, and research data, online insurance eligibility verification, and referrals. Probably most useful, though, is what the company calls a "universal inbox" that collects and sorts all fax, voice, and e-mail messages into one place. Convergence, kids, convergence is the key!

And we haven't even scratched the surface!

Kids' health, women's health (a dual vertical!), and even pet (!) health sites are booming uncontrollably, and of course there's the issue of online prescriptions (How dangerous is that?). Drugstore.com, PlanetRx, and even Walgreens are hot on the trail to get us our Prozac on time. Get your doctor to submit your prescription online, then point, click, add little pills to your shopping cart, auto-pay, and you're golden!

Despite all this skepticism and sarcasm, I'm not above recognizing that all this online health yadda yadda is actually very useful and helpful to lots of people, especially people who don't have the full benefits of insurance and just need small points of reference for their ailments. I'm sure it's also helpful for people who can't leave the house to order prescriptions online or need to communicate with doctors via chats and messaging.

Speaking of chatting, it's been proven that a sense of community does help certain people live longer and learn. And one thing that all these sites offer, even the portals, is tightly integrated community features. As a cancer patient, you might not have questions for doctors; instead you want to talk to other cancer patients about treatments that worked or that didn't, and the psycho-social, economic, and family issues that come with being terminally ill.

In a May 1997 report from the Journal of the American Medical Association (**www.ama-assn .org/sci-pubs/journals/archive/jama/vol_277/no_18/mn7104 .htm**) "Online Support Group Helps Patients Live With, Learn More About the Rare Skin Cancer CTCL-MF"), there was a story about a woman who found a community online. The patient's doctor knew very little about the disease, as did most people she came into contact with. But she was able to find information online and also build a solid support network. The report continues "Online support groups... can give patients and their families practical information as well as reassurance that they need not face their illness or disability alone. [These groups...] meet 24 hours a day, enabling participants to read or post messages at any time. The frequent exchanges commonly foster intimacy and trust, creating a supportive virtual extended family."

But it isn't just the patients who benefit from online health resources. Doctors may visit and find new perspectives from the people affected by illness. "Group members relate positive and negative experiences with their physicians, often citing names. They discuss office staff, hospital care, and insurance companies, as well as differences in treatment and charges made for services and procedures in various locales," continued the report.

Online health services could turn out to be a good thing after all, for doctors and patients alike. ✹

SHEL KIMEN
has worked in the industry, traveled the world, and covered the Internet for both The Net and boot magazine. She can be contacted at **skimen@maximumpcmag.com**.

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GAME THEORY

T. LIAM MCDONALD
is a veteran of PC Gamer magazine and is much bigger than he looks in this picture, so keep that in mind before writing him any hate mail at **tmcdonald@maximumpc.com**.

The Blame Game

SCAPEGOATS AND JACKBOOTS

The minute the smoke cleared in Littleton, Colorado, the finger-pointing began. Not surprisingly, those fingers quickly settled on the fat target of computer and video games.

You can bet that every single youth-centered act of violence will eventually be blamed on gaming. It's convenient for several reasons. Video games can be staggeringly violent. And children do play them. But the key to the popularity of gaming as the cause du jour for society's ills is the simple reality that most adults don't get it, have never tried it, and are easily appalled by its cartoon images of bloodshed.

Inconveniently, games have absolutely zero to do with two outcasts killing their classmates with an eye-popping array of easily acquired guns and bombs.

It's sad that once a year I have to revisit this topic. It's sad that children are cut down in senseless acts of violence. Sad that everyone feels "there must be a reason" and is so ready to fix blame on someone else. But there is no single reason.

Still, we demand an ordered universe, and so we call for a two-pronged assault on our civil liberties: Senate hearings on media and violence, and a lawsuit against game manufacturers by the parents of children killed in a Paducah, Kentucky, school shooting.

The pundit at the center of both is Lt. Col. Dave Grossman. Since every study about violent media has failed to find a conclusive link to real-life violence, Grossman's spin is particularly daft: These aren't games, they're "murder simulators." "It's learning to kill and learning to like it," he says. "Every time a child plays a point-and-shoot video game, he is learning the exact same conditioned reflex skills as a soldier or police officer in training."

That explains why in Japan, where a game console sits on every TV set and the entertainment of choice depicts sadism, murder, and rape, school shootings happen all the time.

But the mainstream media listens to Grossman's line of bull, frowns gravely, and nods. After all, he's a military man. He must be an expert on child psychology. On *60 Minutes*, he made much of the fact that in first-person shooters you creep around corners, kill one character, and move on, much like the killers in Littleton. If the colonel could actually train his soldiers to be killing machines with a few hours of *Doom*, he could do away with boot camp and basic training.

"Society helps parents with such things as a child's access to tobacco, guns, drugs, alcohol," Grossman says. "We have laws that say anybody who gives your kids this stuff is a criminal. Why on this one subject do we say, 'You're on your own?' Then we hold the parents accountable when their child becomes a killer."

Goddamn right they are. I don't want to hear another word about how *Doom* drove Eric Harris and Dylan Klebold to their murderous rampage until I see their parents in handcuffs. These kids built more than 50 bombs in the garage, for god's sake. Neighbors *across the street* heard them for several days breaking glass for fragmentation grenades. There were bombs and a sawed-off shotgun on one kid's dresser, in plain view. I couldn't get a porno mag in my room without my mom finding it, and these kids have TEC-9s?

Only one person is responsible for committing a violent act: the perpetrator. When the murderer is a child, the parents must share some of that blame. That Harris's and Klebold's parents professed surprise is the surest testimony of their culpability.

I'm a parent. Maybe I'm a good one, maybe not. I'll tell you in 15 years. What I do know is that I'm an alert parent. I pay careful attention to my son and the things in his life, and I'm arrogant enough to say that I would have known if my kid was building bombs in the garage.

Parents say they don't know about their children's insular world of music, movies, TV, and games, despite detailed ratings systems. Even the pokenoses at the National Institute on Media and the Family admit the fault lies with parents. "Most parents do not know what many of their children's games contain," their 1998 report concludes, "and most do not use the rating systems that are available." The NIMF even grudgingly gave the game industry an "A" for its ratings system.

Grossman wants something stronger than the movie rating system. He wants legislation that will make it illegal to give a minor access to *Quake*, like porn and alcohol. He's saying parents don't know what's right and wrong for their children, so we should make them criminals if they play games with them.

And the politicos are listening. They need to be seen doing something, and spitting on civil liberties is always a good place to start.

Sure, we'll call 'em "murder simulators." Who'd argue for kids' access if we can get *that* spurious label to stick? We'll wait for a tragedy, which is inevitable given the shoddy state of parenting and easy access to weapons in our society, then manipulate the events for our own ends. We'll make up some cock-and-bull story about conditioned responses, since reporters are too lazy to seek out the studies that show that argument is also a lie. If we talk loud enough, maybe people won't hear our jackboots kicking in their doors.

"Every time a child plays a point-and-shoot video game, he is learning the exact same conditioned reflex skills as a soldier or police officer." **—Lt. Col. Dave Grossman**

The Empire

A long time ago, in a galaxy far, far away, Microsoft's Imperial Forces initiated a technology battle plan called DirectX. DirectX quickly conquered the galaxy and now runs the majority of today's most advanced computer simulations. Kevin Bachus, one of the master strategists behind DirectX, reveals the Empire's upcoming secret plans...

Maximum PC How would you describe DirectX to someone who really doesn't know what it is?

Bachus DirectX provides transparent access to the broadest range of hardware for the broadest range of software. DirectX enables us to say, "Any piece of Windows software should run on any system and make use of all the capabilities in that system, without requiring the programmer to know what hardware is actually in the system."

Maximum PC What are the major changes in DirectX 7?

Bachus With DirectX 7, we're supporting a new generation of graphics cards that can do transforms of lighting on the graphics chip. A lot of consumers are surprised to find that, even though they have a 3D accelerator, a lot of the graphics calculations are still done in the CPU. DirectX 7 will free up the CPU for sound processing, artificial intelligence, physics, or even more graphics processing. That means higher-quality graphics because objects can have much more detailed polygons counts. Also, overall performance will improve because you'll be offloading tasks to the graphics chip.

Maximum PC What 3D feature are you most looking forward to?

Bachus In the short-term, multitexturing is going to have the most impact. Last year we started to see devices that could combine two textures simultaneously, this year and next we'll start to see devices that can apply far more. DirectX 6's specs support up to nine texture stages.

Maximum PC Will DirectX 7 allow extensions? Some developers say they'll cause major problems. Any truth to that?

Bachus There are two camps. One says that hardware manufacturers may come up with some sort of capability that Microsoft didn't anticipate, and developers think it would be very beneficial to allow those hardware manufacturers to add those capabilities out of cycle with DirectX releases.

Another group is very concerned that the API might diverge to the point where a developer would have to write specific code for each graphics chip in order to use extensions provided by the hardware manufacturers.

We've seen that Microsoft can provide the structure to resolve these issues in a way that moves the whole industry forward. The assumption that we're not going to do a proper job is an assumption that Microsoft is dictatorial. That's frankly not true. We don't go into some dark vault in Redmond and come out with an API a year later. We're constantly meeting with hardware manufacturers and software developers... and we're an advocate. Unfortunately, you can't please everyone. There are people who will feel their position was right and should have prevailed.

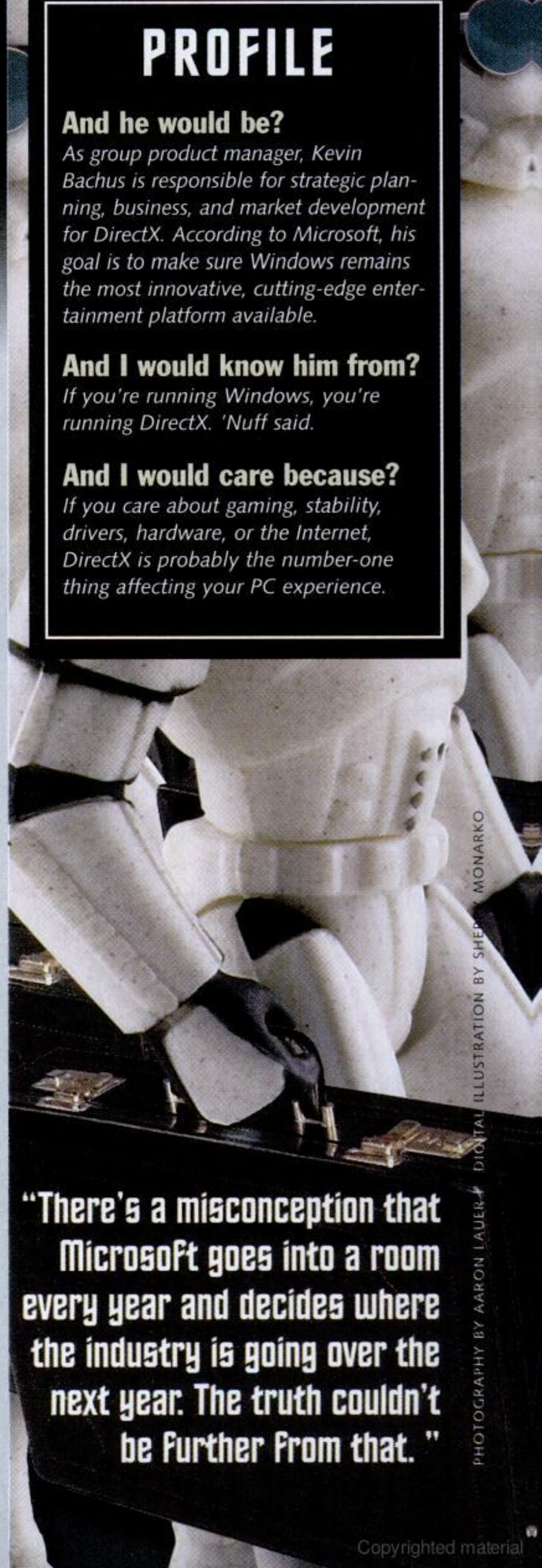
Some people probably still feel that our decision to include a texture-compression standard in DirectX 6 was controversial. We don't think it was controversial at all. Software developers had been telling us they wanted a single texture-compression scheme that would work on the widest range of hardware. We had no intention of preventing hardware manufactures from adding their own, if they wanted to, so we invited them

PROFILE

And he would be?
As group product manager, Kevin Bachus is responsible for strategic planning, business, and market development for DirectX. According to Microsoft, his goal is to make sure Windows remains the most innovative, cutting-edge entertainment platform available.

And I would know him from?
If you're running Windows, you're running DirectX. 'Nuff said.

And I would care because?
If you care about gaming, stability, drivers, hardware, or the Internet, DirectX is probably the number-one thing affecting your PC experience.



PHOTOGRAPHY BY AARON LAUER / DIGITAL ILLUSTRATION BY SHERRY MONARKO

"There's a misconception that Microsoft goes into a room every year and decides where the industry is going over the next year. The truth couldn't be further from that."

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Talks Back

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With HomeFree you can network your home PCs with the wires you already have.

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Put a HomeFree Wireless network card into each desktop PC or laptop you want connected. Shortly, your entire household will be sharing the Internet, printers, and files within a 150' range—without any wires or cables. Plus, HomeFree's frequency-hopping technology means your network is both reliable and secure.

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Enter the HomeFree Sweepstakes by visiting our website at http://www.diamondmm.com/homefree

DIAMOND MULTIMEDIA

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to submit proposals and selected one. If another compression scheme is equally compelling, I suppose a hardware manufacturer could encourage someone to include yet another compression scheme in its application. But at the end of the day we needed to tell hardware manufacturers, "Look, this is what the software developers want. We're going to choose one."

Maximum PC What's the number-one complaint from developers these days?

Bachus That there's still more optimization we can do, more features that we can be added. And we agree. In terms of performance, we're never going to be entirely happy until there's absolutely no overhead between an application and hardware. And that's very hard to achieve because there's always going to be some layer. The question is, how big or how tiny is that layer?

Maximum PC What is the number-one source of frustration for you?

Bachus There aren't enough hours in the day or enough smart people in the world to do everything we have—and want—to do. People tend to have this perception that Microsoft should be able to snap its fingers and produce a bug-free operating system tomorrow—for free. The truth is that we're subject to the same laws of software development as everyone else. We'd love to be able to do everything, but at some point we have to say "Look, this is realistically what we're capable of delivering."

Maximum PC So, what do you focus on when developing new versions of DirectX?

Bachus There are six things we look at: compatibility, robustness, performance, a broad range of features, delivering updates on a timely basis, and the simplicity of the programming interface. But a lot of those are in conflict with each other. We could provide more performance at the expense of robustness. If you didn't mind your computer crashing every 10 minutes, we could probably make it really, really fast.

Hardware manufacturers need to strike a balance. At this point, it's not sufficient just to innovate in performance. Jittery framerates detract from the overall experience, but there are other measures of quality, as well, and the most successful hardware manufacturers are the ones that produce fast products with quality enhancements, too.

Maximum PC One of the criticisms that has been levied against DirectX is that it's limited to the Windows platform. How important is portability?

Bachus There's nothing that fundamentally says we can't have DirectX on other platforms. In fact, we provided DirectX and Windows CE on the Sega Dreamcast. The issue is really how we take the people working at Microsoft and focus them on different problems. When we go to developers and say, "Would you rather have support for hardware transforms and lighting, or would you rather have DirectX 6 on another platform?," invariably they want new features in Windows.

It's not a money question either—it's a people question. There are only so many people in the world, and only so many people who work at Microsoft, and only so many of the people who work at Microsoft can do these things. It's not an issue of being unwilling to spend or to support other platforms, it's a question of taking care of requests.

id Software spent an incredible amount of time, and had an incredible amount of discipline and focus, making sure *Quake III Arena* was designed top to bottom for portability. It's not just their use of OpenGL that enables them to do that—it's their use of very careful coding conventions, and it's the way they really condensed their audio calls into specific functions that they can change based on platform dependencies. It's a way they've basically created an abstraction layer around the application that they can go in and plug platform-specific things into.

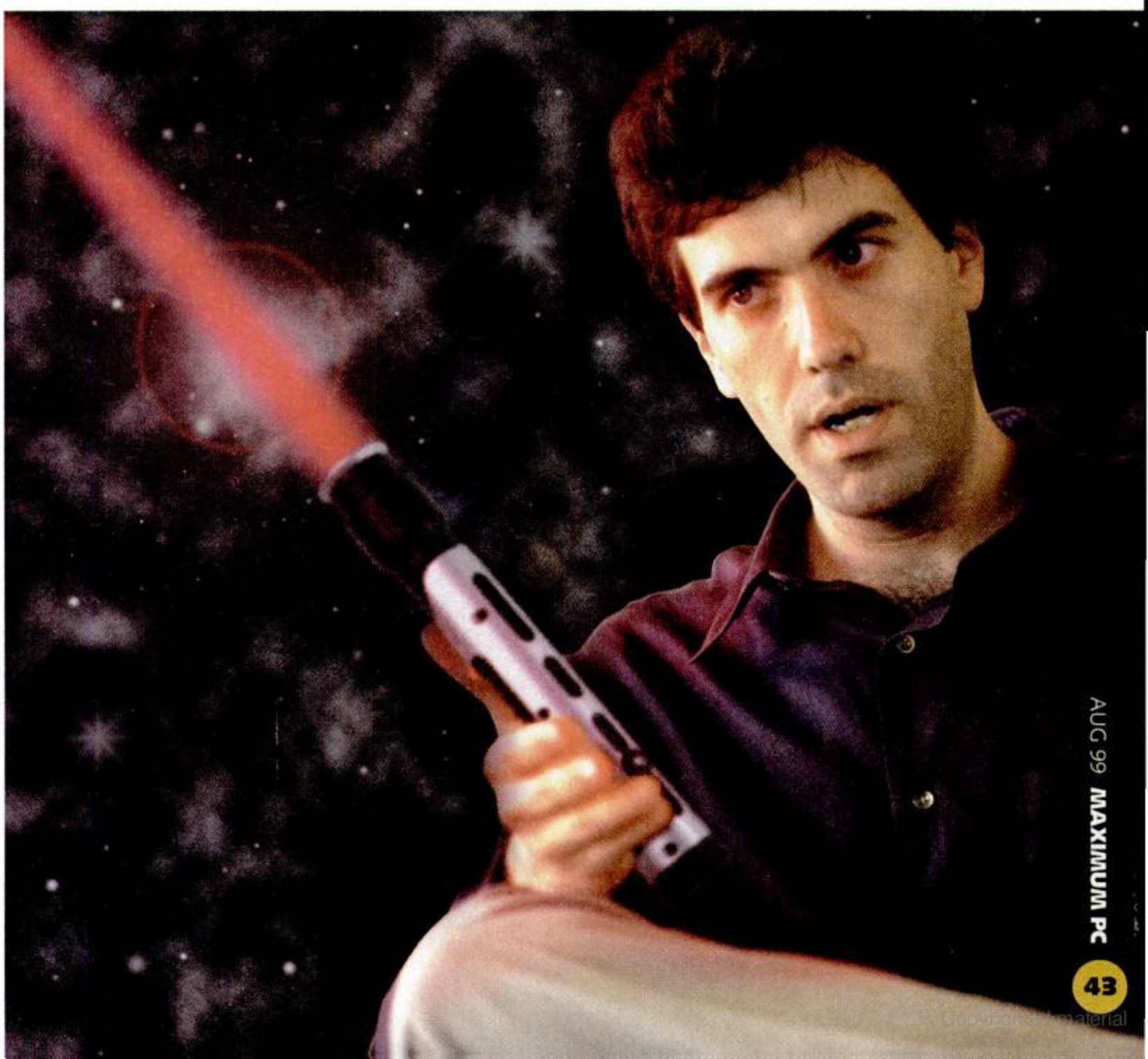
Maximum PC How big is the DirectX team?

Bachus We have about 150 to 200 people actually delivering the DirectX foundation APIs. But there are people not in this core team who work on DirectX components.

Maximum PC DirectX had some problems when it first came out, but over the years it has radically improved and most developers have jumped onboard. Why hasn't the creator of Quake, John Carmack?

Bachus [grins] You'll have to ask John Carmack. Developers, being a creative lot, have very clear ideas about how they want to do things and how they expect things to work. That's why it's important for us to continue to talk to them and to understand

"THERE AREN'T ENOUGH HOURS IN THE DAY OR ENOUGH SMART PEOPLE IN THE WORLD TO DO EVERYTHING WE HAVE—AND WANT—TO DO."



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how they do things. We've all done an incredible amount of growing up over the last four years since we introduced DirectX.

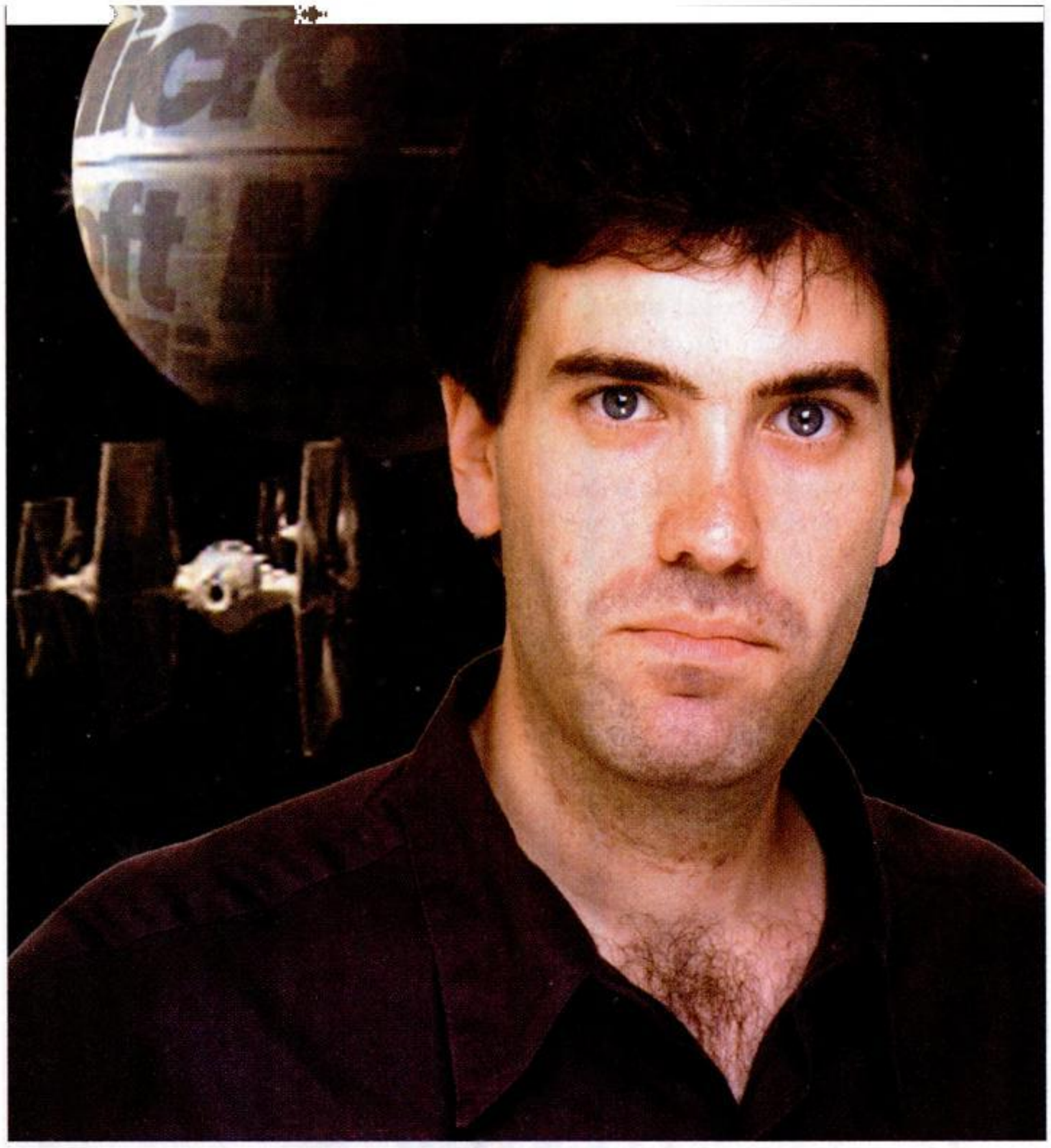
Maximum PC Does it bother you that Quake III Arena doesn't use Direct3D?

Bachus No. id Software makes all its games available on other platforms, but clearly the majority of its users are on Windows. That makes Windows customers happy, and that in turn makes me happy.

That said, there's a lot that we can learn from developers who choose not to use DirectX. We certainly learn from the things that John Carmack says about Direct3D, and use them to improve it. Would I be happy if id Software said it was going to start using Direct3D? Of course I would, because that would mean we've done our job properly. It doesn't do us any good to build a product that our customers don't want.

Maximum PC What about the rumors that DirectX will be discontinued in favor of OpenGL?

Bachus There's a natural tendency to assume there's going to be just one way of doing things, and that in order to have something new, the old thing must die. But the history of software shows that's not the



"WE CERTAINLY LEARN FROM THE THINGS THAT JOHN CARMACK SAYS ABOUT DIRECT3D AND USE THEM TO IMPROVE IT. WOULD I BE HAPPY IF ID SOFTWARE SAID IT WAS GOING TO START USING DIRECT3D? OF COURSE I WOULD."

case. The work that we're doing with Silicon Graphics is not designed to replace or supplant OpenGL in any way. It's not designed to replace or supplant Direct3D. In fact, the graphics APIs we're going to be producing are clearly designed to be part of DirectX. Does that mean it's going to have the same limitations professional developers have faced when looking at Direct3D? Of course not. It should support professional applications as well. Does it mean restrictions for consumer software developers? If that's the case, we haven't done our jobs properly.

It's probably more appropriate to look at the Fahrenheit era in the same way that DirectX 7 will replace DirectX 6, and DirectX 6 replaced DirectX 5. In terms of functionality, it's going to be a pretty big leap forward. In terms of starting over from scratch, that's not the idea. In terms of forcing people to learn entirely new ways of programming, that obviously wouldn't be our intention either.

Maximum PC Graphics card companies are notorious for frequent driver updates. What role does Microsoft play in driver problems?

Bachus Driver problems are our biggest support-call issue, but it's difficult for us to talk about that without seeming like we're pointing fingers. We understand that Microsoft has a lot of responsibility in working with hardware manufacturers to make sure the drivers are as high quality as possible, and we are a resource that can confirm that what they're doing will work on every conceivable operation. A lot of pressures are applied to hardware manufacturers, and I really don't envy their position. They're constantly looking to get the last bit of performance out of their parts, while constantly striving to get in deals with different OEMs and board manufacturers.

Maximum PC Does a company such as 3dfx or nVidia have more influence on new DirectX features than a smaller company such as Trident?

Bachus They're on equal footing. Certainly, 3dfx and nVidia tend to be more aggressive about introducing new features and they push us hard to think about new things we need to apply. Ultimately, however, both types of companies' feedback pales in comparison to software developers' feedback. They're the ones who tell us what to put into DirectX. If their requested features are aligned with the features hardware manufacturers are putting in, great. Otherwise, we have to do some negotiation.

Maximum PC So Microsoft is just a go-between?

Bachus Sure. Microsoft is unusual. We're the only company that talks to all the people playing in this segment. We talk to Intel, AMD, the graphics and audio manufacturers, and the software developers. There's a misconception that Microsoft goes into a room every year, decides where the industry is going over the next year, then comes out with a finished version of DirectX. The truth couldn't be further from that. We're always saying to these people, "Where do you want to be two or three years from now, and what do we have to do to get you there?"

We're all in this together.

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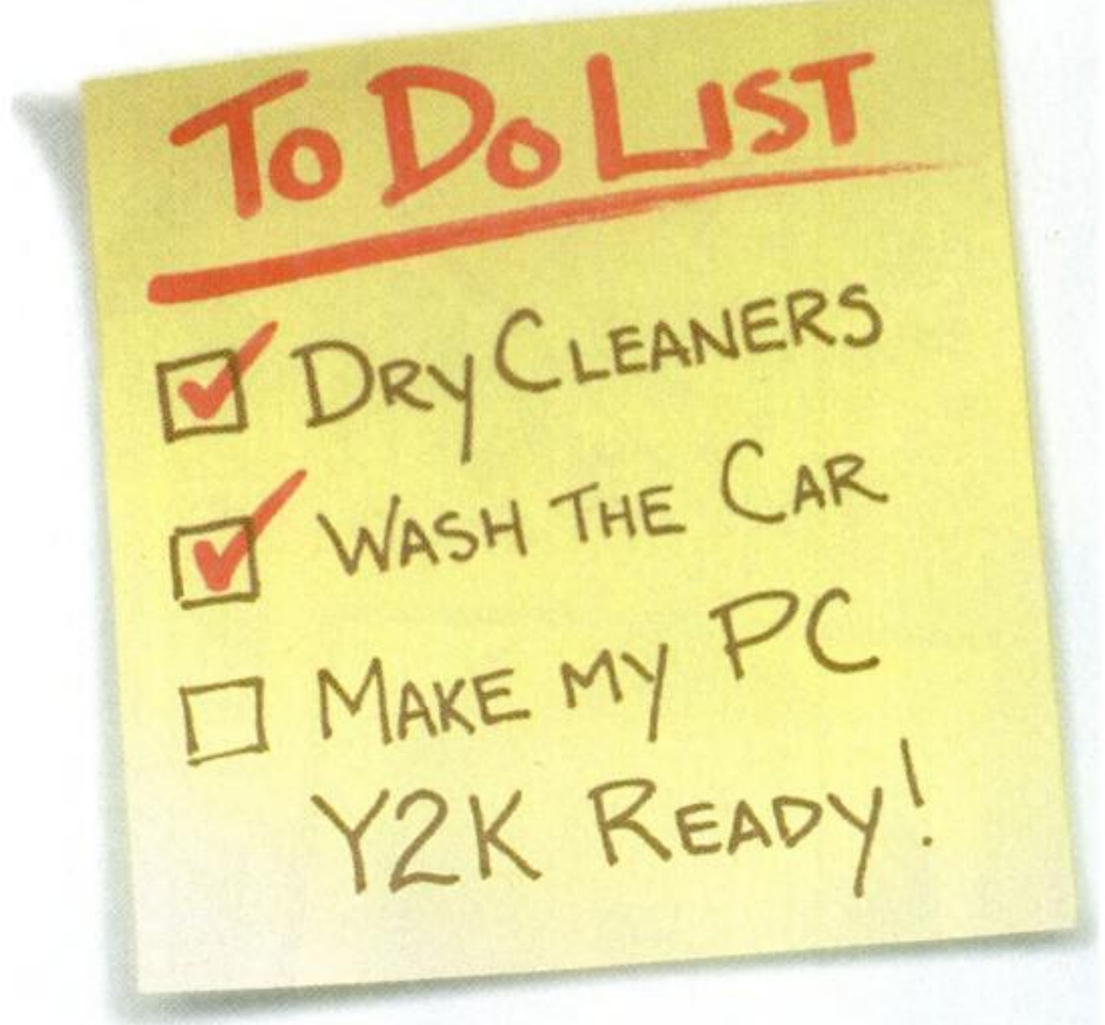

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Networking

Connecting two computers together has become easy enough for Granny and Gramps. But just because the latest networking kits are built for buggy riders, it doesn't mean they can't speed in the fast lane...

BY SEAN CLEVELAND AND GORDON UNG

You might *think* you're a fully decked computer dude, but unless you're swapping data between two networked machines, you're really still splashing in the kiddie pool.

In fact, if you're running a small office or home office (SOHO) with multiple machines, networking is a must.

With a network, you can share devices such as printers and modems between multiple machines. Hell, you can even share drives—CD-ROM, CD-R, DVD, Zip, whatever. Networking makes swapping files an instantaneous process and multiplayer gaming a latency-free dream (and you can hear the cries and cheers of competitors in realtime).

Until recently, networking has been expensive and complicated—the province of corporate offices and the IS departments that run them. But thanks to a slew of new products, networking has reached a level of simplicity and affordability that puts it within the reach of the home user. So whether you want to tether your machines with classic Ethernet cable, use the existing phone lines that run throughout your pad, jack those heretofore unused USB ports, or even fly wireless, the choice is yours.

Networking is all about taking the plunge into a specific standard. You can do only so much research before you've considered all the pluses and minuses of the different technologies and have to make a hardware decision. This is tough, because once you choose a specific technology, you'll have to stay with it for the life of your network.

This month we've gone network crazy, with reviews of 20 networking products across five different topologies. The slate includes classic Ethernet (10BaseT, 100BaseTX, Cat-5 cabling); wireless networking, including coverage of the cutting-edge RadioLAN technology; USB-to-USB networking and USB-to-Ethernet adapters; and the current fave, phoneline networking. We even review Intelogis's controversial powerline networking kit and share insight on the future of home servers. You'll learn what makes up a standard networking kit, the strengths and weaknesses of each connecting topology, and which is right for you.

HOW WE TESTED

There are a lot of things to consider when buying into a networking technology: maximum number of users, support for sharing peripherals, and operating-system compatibility, to name just a few. If you're a beginner or a feeb, you may also consider ease of installation. And speed, of course, always reigns supreme. We ran each networking kit through the following tests, and based much of our final verdicts on the results.

- **COPY TESTS:** Because different types and sizes of data are sent differently, we chose three different copy tests using data that's representative of a typical user's needs.
  500K: Records the copy time of 70 document and spreadsheet files ranging from 3K to 17K for a combined total of 500K. Represents the type of data that's typically transported on media such as floppy disks.
  10MB: This test is comprised of 122 files ranging in size from a 3K up to 1MB. This test best represents what a typical file directory contains. Shows the time it takes for the files to be sent or broadcast across the network.
  25MB: A single large file (the second trailer of *The Phantom Menace*) is copied to show the speed at which large files are copied across a network.
- **QUAKE II BENCHMARK:** A purely subjective test to determine latency and the quality of the multiplayer gaming experience.
- **MULTIMEDIA STREAMING:** We played an MP3 file across the network both ways and rated playback quality.
- **PRINT TEST:** Used to verify that shared printing does indeed work without problems. (In the individual reviews, we call attention to this test only if problems occurred.)
- **INTERNET SHARING:** This test was performed on every kit/adapter that came with Internet-sharing software. We looked at ease of setup, documentation, actual usage, and available features.

We begin our networking tour with a look at all the fancy-pants phoneline kits that are flooding store shelves. Our findings are most compelling...

PHONELINE NETWORKING KITS 48

WIRELESS NETWORKING KITS 51

CLASSIC ETHERNET NETWORKING KITS 53

USB ADAPTERS/ POWERLINE NETWORKING KITS 58

NETWORKING TECHNOLOGIES: DARE TO COMPARE 60

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpcmag.com.

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Phoneline Networking Kits

Jacking in has never been so easy

Consider yourself warned before you plunk down for a phoneline kit. Don't expect to quickly copy large files from one machine to another. Don't expect your Net cruising to speed up. In fact, expect it to slow down if you're sharing network bandwidth. And don't think you'll burn a CD-R across the network without making a few coasters.

That said, we didn't expect to be impressed by any of the phoneline kits, but after testing, we were pleased by the little time required to get a network running—all without manually configuring network connections. And because phoneline networks work in the 5.5MHz to 9.5MHz range, voice calls aren't disturbed.

Diamond HomeFree
PHONELINE NETWORK KIT

PLUSES
- Status lights
- Price, price, price
- Easy setup
- Logs of URLs visited by client machines

MINUSES
- No RJ-45 port

HomeFree turned in the easiest installation, quickly followed by Intel's AnyPoint. Although the Diamond manual is sparse on illustrations, it does walk you through any snags you might encounter. Not that we needed to touch the manual, since HomeFree installed effortlessly.

We were able to simultaneously stream MP3s, surf the net, and print without suffering MP3 drop-outs. *WinGate*, the Internet-sharing software, allows only three unlicensed machines on your network, but that's probably enough for most homes (if you want to add more net-sharing nodes, *WinGate* offers discounts to those who already own the three-user versions). Features such as an RJ-45 network port and noise filters would have sweetened the deal, but HomeFree is still a good buy. In a field where practically everyone is using the same reference design and controller chip, HomeFree's trouble-free setup gives it a leg up.

Diamond's HomeFree cards appear in many Compaq Presario desktop systems.

MAXIMUM PC VERDICT

Price $99 (two-node kit)
Company Diamond
Phone 800.468.5846
URL www.diamondmm.com

8

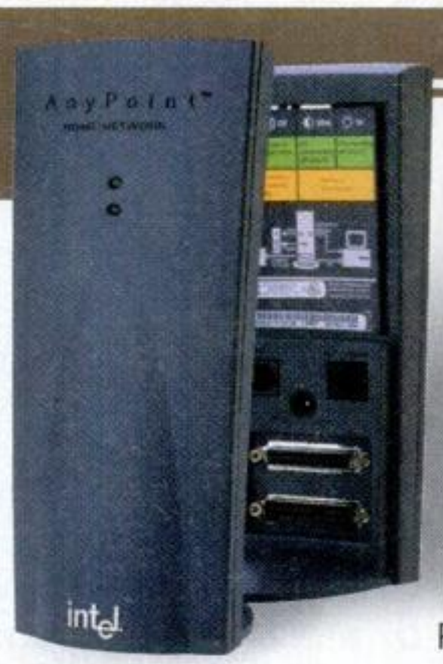
Intel AnyPoint Parallel Port
HOME NETWORKING KIT

PLUSES
- Status lights
- Printer pass-through ports
- Surprisingly fast
- Easy to set up

MINUSES
- Slight laggage in gaming
- Pricey

Although you may think parallel-port devices are as dead as Pauly Shore movies, there are still people who appreciate both. We normally wouldn't recommend using your slow parallel port for anything but printing, and passing a network through the same port that hosts your existing printer is like inviting Pauly Shore home for dinner: You're just asking for trouble. With AnyPoint, however, Intel does pass-through justice.

Instead of giving you just one pass-through, AnyPoint Parallel gives you the opportunity to hang two printers off your network. Raw throughput was surprisingly good for parallel, coming damned close to its PCI counterpart. We were able to simultaneously print, browse the net, and stream MP3s from both machines without serious slowdowns. About the only discernable difference was in gaming: Latency introduced somewhere in the pipe dragged down *Quake II* in multiplayer. Although it was still playable, the performance hit told us to stay away from the parallel-port kit for serious gaming. This kit best serves notebook users and people who want to save a PCI slot.



Intel's parallel port device isn't as fast as its PCI device, but it won't force you to give up a slot.

MAXIMUM PC VERDICT

Price $99 per node, or $189 for two-node kit
Company Intel
Phone 800.628.8686
URL www.intel.com

7

It's Still Hot!

TIP #1

Remember not to plug your phoneline into the NIC before plugging or removing the NIC from your machine. Although your PC may be powered down, your phoneline carries a slight amount of voltage, which may be just enough to damage the NIC or your computer.

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Intel AnyPoint PCI
HOME NETWORKING KIT

MAXIMUM PC KICK-ASS! product

The DSP on this baby is straight from the Intel silicon labs!

Intel's AnyPoint wins hands-down for having the best documentation. It's so easy to install, even Forrest Gump could set up a network. Based on Intel's own 21145 network controller, AnyPoint also turned in the best performance of the phoneline pack (though differences were negligible overall).

While the maximum 1Mbps throughput won't set any speed records, we successfully browsed the net, printed, and streamed an MP3 file from the client PC without having the music skip a beat. Load those gigabytes of MP3s on your server, and you have an instant jukebox. *Quake II* framerates in multiplayer were butter-smooth.

Because Home PNA kits are designed for ham-fisted tyros, Intel walks the user through drive- and printer-sharing set up. Intel also gives you the ability to deny net access from individual PCs. A single LED indicator on each card shows I/O activity. While the card is pricey when compared to other worthy contenders (such as Diamond's Homefree), AnyPoint is the choice if you're looking for the easiest installation.

PLUSES
- Status light
- Effortless installation
- Good documentation

MINUSES
- No log of surfing activity
- Pricey

MAXIMUM PC VERDICT

Price $79 per node
Company Intel
Phone 800.628.8686
URL www.intel.com

9

Zoom HomeLAN
PCI CARD

See that RJ-45 jack? Don't even think about using it mixed with the RJ-II.

Phoneline cards based on the AMD controller are fairly generic, but Zoom took the time to add in all the bells and whistles available. There's RJ-45 in addition to RJ-11, as well as filtering on the phoneline port. A full set of status lights includes data-collision detection. Like the other cards in this roundup, the ports cannot be used concurrently but may come in handy for networking parties.

As far as speed, the HomeLAN was neck-and-neck with the others, and turned in minty-fresh framerates. Our main complaint is that the HomeLAN requires extra installation and configuration steps. Although the instructions are complete and straightforward, Zoom wants you to walk through extra steps to get up and running. Another peeve is the requirement that you must register *SyGate*—the application that shares your Internet access among clients—in order for it to go from trial to full version. And it's limited to only two Internet connections. Oy. We also had to enable DHCP in order to get the network up and running, something the manual doesn't tell you to do. Zoom seems to have the hardware down—now it just needs to polish the software.

PLUSES
- Full set of status lights
- RJ-45 port
- Free noise filter

MINUSES
- Installation requires too much manual input

MAXIMUM PC VERDICT

Price $50 per node
Company Zoom Telephonics
Phone 800.666.6191
URL www.zoom.com

7

Linksys
NETWORK IN A BOX

Linksys offers the best solution if you want RJ-45 support and the AMD controller in one kit.

Although the software installation wasn't as straightforward as Diamond's HomeFree, we think Linksys's Network In A Box offers the best solution if you want both the AMD controller and RJ-45 support. We had high hopes of using the RJ-45 alongside the regular RJ-11 phone jack as a cheap phone-to-Ethernet bridge, but the card doesn't support running both ports concurrently. Bummer. The second port could come in handy in homes or offices that plan to upgrade to 10BaseT, or for times when you want to connect your machine to a friend's Ethernet LAN for multiplayer gaming.

The Linksys kit passed our simultaneous printing, browsing, and MP3 streaming test with nary a problem. Linksys provides an informative manual that may be a little advanced for beginners, but tips such as "how to recognize a Cat-5 cross-over cable" make it a gem.

PLUSES
- Filters
- Status lights
- RJ-45 port

MINUSES
- Not friendliest kit to install

MAXIMUM PC VERDICT

Price $85 (two-node kit)
Company Linksys
Phone 949.261.1288
URL www.linksys.com

8

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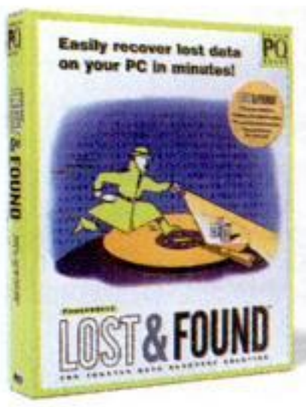

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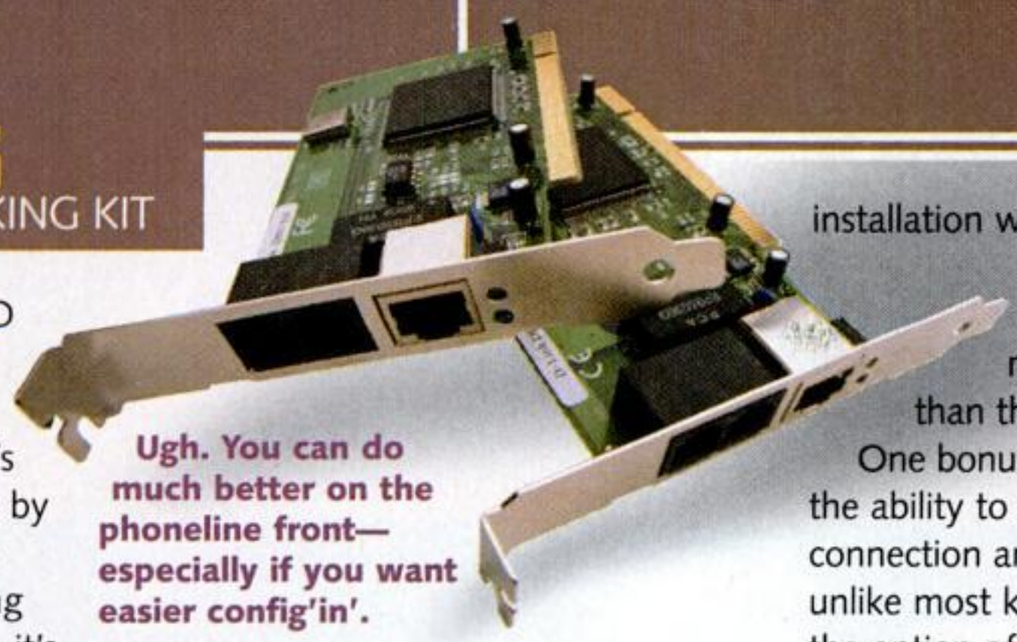
D-Link DHN-905
HOME NETWORKING KIT



Ugh. You can do much better on the phoneline front—especially if you want easier config'in'.

Based on the same AMD controller that's found in the Zoom, Diamond, and Linksys kits, D-Link's kit differs from the pack by relying on the MidPoint Gateway Internet-sharing software. Unfortunately, it's a "lite" version of the software, and D-Link emphasizes this fact by pimping screen after screen of features you *could have* if you paid for the full version. You get the feeling that you shelled out money for something you didn't actually get.

Performance-wise, the D-Link kit was neck-and-neck with the rest of the pack. However, we did experience music drop-outs when simultaneously surfing, printing, and streaming MP3s—problems we didn't have with any of the other AMD-based kits. Hardware installation was straightforward, but the *MidPoint* software took far more configuration than the other kits.

One bonus D-Link gives you is the ability to share your Internet connection among 25 machines, unlike most kits here that give you the option of using only three PCs on the Internet before you have to buy more licenses.

PLUSES
- Status lights
- Separate RJ-45 port

MINUSES
- MidPoint software confusing, lacking in features
- Internet sharing didn't work with our ISP
- MP3 drop-outs

MAXIMUM PC VERDICT

Price $89 (two-node kit)
Company D-Link
Phone 800.326.1688
URL www.dlink.com

5

Wireless Networking Kits

Free-range clickin'

Wireless networking transmits data via unlicensed radio waves. It precludes messy floor cables and can be great for networking notebooks and desktops together. We were impressed with the performance of kits offered by WebGear and Proxim (reviewed in June; check the Reviews Database on our web site), and we also like the kits reviewed below. But make sure you understand the limitations of current wireless technology before you jump in head-first. Speed costs a premium, and signal integrity is always an issue.

We've always balked at promises of wireless technologies that boast "Ethernet speeds." We will now eat crow. RadioLAN's 5.8GHz solution is da bomb and worthy of any extremist's arsenal. Now if the prices would just come down.

SOHOware CableFree
WIRELESS HOME NETWORKING KIT

CableFree's ease of setup and signal strength are on par with Webgear, but the price is a real turnoff.

NDC breaks into the wireless scene with CableFree, a 2.4GHz frequency kit offered under the SOHOware pseudonym. The kit packs two ISA-based cards with attached antennas (each antenna is afforded three feet of cord). You also get installation and Internet-sharing software.

Using descriptive dialog boxes, the setup wizard simplifies the otherwise heady process of establishing computer/group name assignments and file/printer sharing. Setup also installs a few troubleshooting and monitoring utilities. One utility uses a bar chart to show data throughput (both upstream and downstream), total uptime, and signal quality.

Sygate 2.0 enables Internet sharing with well-designed configuration screens. The version we received allows three concurrent users to transfer up to 75MB before the trial terminates. This has since been changed to two-user/unlimited, so make sure you get the unlimited deal if you're a two-computer household.

Under the gun, the CableFree Wireless transfers data at around 950Kbps across close distances (the advertised speed is 2Mbps). Our gaming test showed no visible lag. In fact, signal integrity and strength over long distances were quite amazing, and almost on par with the Kick Ass WebGear kit reviewed in June. Almost. The only thing that denies the SOHOware kit a Kick Ass award is its price.

PLUSES
- Great software
- Strong signal over long distances
- Fast transfer rates and no gaming lag
- External antennas

MINUSES
- Only a two-user Internet-sharing license
- Pricey

MAXIMUM PC VERDICT

Price $395 for kit; $199 for individual cards
Company NDC Communications
Phone 800.632.1118
URL www.sohoware.com

9

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RadioLAN CardLINK
WIRELESS NETWORKING KIT

It's the most powerful wireless kit available to home users—only power folk need apply.

RadioLAN sets itself apart from the competition. *Way apart.* Unlike all other wireless products currently shipping, RadioLAN broadcasts data packets at 5.8GHz, where no interference exists. It does this by leveraging the FCC's new Unlicensed National Information Infrastructure (U-NII) band that's been set aside specifically for high-speed wireless networking. What you get is the fastest wireless networking kit currently available to consumers. RadioLAN even claims it's faster than a 10BaseT network! A simple glance at the benchmarks shows this is wrong, but scores were close at 8Mbps to 9Mbps.

RadioLAN sells cards individually. The ISA cards are simple-looking and contain 15-pin external connectors, to which massive antennas are hooked with detachable, proprietary 8-foot cables. The PC card options look more like durable cell phones with fat, swivel-based antennae.

These cards are not for novices. You have to use DOS-based utilities to manually set hardware resources. You'd also do well to have a passing knowledge of IRQ and port settings. Indoor range is only 120 feet, although outdoor range increases to a mile with the BridgeLINK solution. It's not cheap, but if no-compromise wireless networking is required, look no further than RadioLAN.

PLUSES
- The best broadcast signal
- Near 10BaseT performance

MINUSES
- Expensive
- No Internet-sharing software
- Limited indoor range
- Complex DOS utilities

MAXIMUM PC VERDICT

Price ISACardLINK: $399; PC CardLINK: $499; Campus BridgeLINK: $2,999
Company RadioLAN
Phone 888.272.3465
URL www.radiolan.com

9

Classic Ethernet Networking Kits

Tethered to the T1

Ethernet is more than 25 years old, enjoys an installed base of millions, and is the king of all LAN protocols. It offers standard throughputs of 10Mbps and 100Mbps, and does it all through cables and a central hub. Although other technologies such as wireless, USB, phoneline, and even powerline look to be the new hot ticket, Ethernet is here to stay. No other connection technology can deliver the same sheer node volume and throughput.

Now Ethernet is affordable for home use. If you're transferring large files or working with large bandwidth data such as video, we recommend that you consider Ethernet—and all its cabling—before the other technologies in this feature. Sure, it requires a hub and those cables cost extra, but you'll never fret over stability, curse your network for noncompatibility, or bitch at games for lag. And as for the messy wires on floors? Duct tape always works.

Here we review five Ethernet network-in-a-box kits (complete with NICs, hubs, and cables) and a fully self-contained Ethernet server.

SOHOware Fast!
ETHERNET KIT

You can forget about 10Mbps support from da hub.

SOHOware plowed though our benchmarks with the fastest times. These peppy little 10/100 cards are fast! Unfortunately, the bundled SFH105A hub doesn't provide kick-ass compatibility. This five-port fast Ethernet hub (with one shared uplink port) only supports 100Mbps (which is precisely what Fast Ethernet stands for: 100Mbps). This means that if a friend brings his 10BaseT-packin' machine over for gaming, he's out of luck. It also means he can't use the 10BaseT connection on his phoneline card or even use a USB-to-Ethernet adapter, because the hub only supports 100Mbps connections. The hub also doesn't support full-duplex operation.

The kit comes with a two-user version of *SyGate* that never expires and that you can upgrade for more users. 100Mbps is great, but for $5 more, the Linksys kit is the better buy.

PLUSES
- NICs support both 10/100 speeds
- Fastest benchmark scores

MINUSES
- Hub only supports 100BaseT NICs
- Hub doesn't fully support full-duplex speeds
- Minimal documentation

MAXIMUM PC VERDICT

Price $135; $20 each additional card
Company NDC Communications
Phone 800.632.1118
URL www.sohoware.com

7

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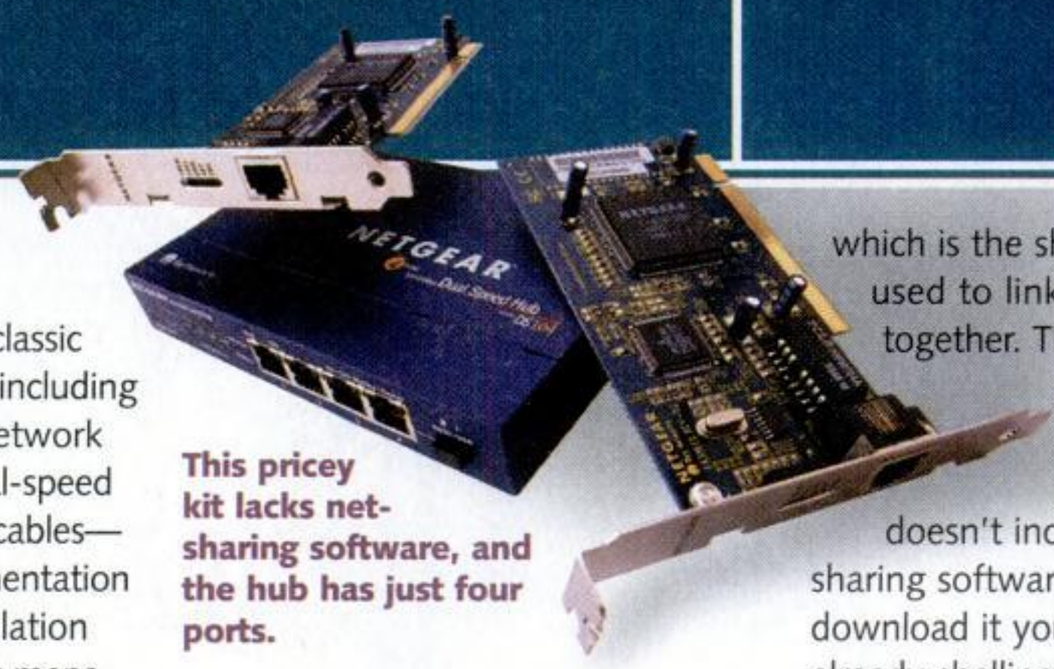
Netgear DB104
NETWORK STARTER KIT

PLUSES
- NICs support both 10/100 speeds
- Pretty lights on the hub

MINUSES
- Hub doesn't fully support full-duplex speeds
- Little documentation
- No Internet-sharing software
- Hub contains only four ports (with shared uplink)



This pricey kit lacks net-sharing software, and the hub has just four ports.

Bay Networks takes the classic approach to Ethernet by including two FA310TX 10/100 network adapters, a four-port dual-speed hub, two 25-foot Cat-5 cables—and nothing else. Documentation consists of adapter installation instructions and fold-out maps that graphically depict file and printer sharing. That's it.

NetGear's DS104 dual-speed hub is of all-steel construction and feels very durable. We especially like the utilization lights across the front, something no other hub in this roundup offers. Lights above the plugs on the ports themselves designate active 10Mb or 100Mb connections. Separate data collision lights for each are also present. The downside is that only four-ports are available, one of which is the shared uplink that's used to link multiple hubs together. The DS104 doesn't support full-duplex operation.

The kit also doesn't include Internet-sharing software. Yeah, you can download it yourself, but you're already shelling out hard-earned ducats for this stuff.

MAXIMUM PC VERDICT

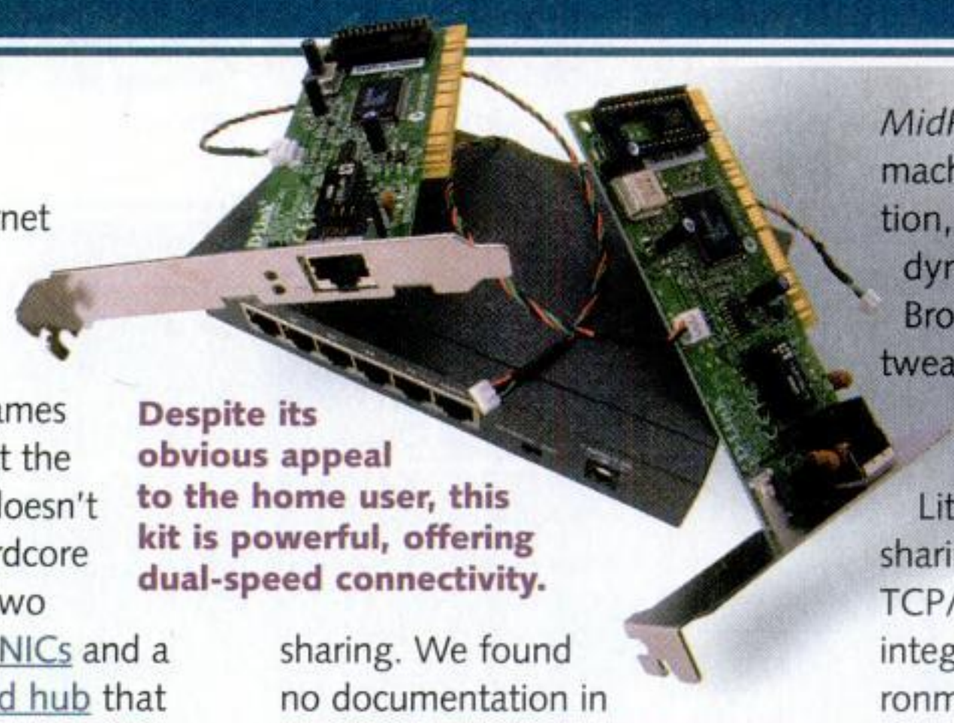
6

Price $179
Company Bay Networks
Phone 888.638.4327
URL netgear.baynetworks.com

D-Link 10/100
NETWORK IN A BOX

PLUSES
- Games CD (Diablo & WarCraft II demos)
- Internet-sharing software
- Five-port hub with separate uplink
- NICs support both 10/100 speeds

MINUSES
- Hub doesn't fully support full-duplex speeds
- Cryptic documentation



Despite its obvious appeal to the home user, this kit is powerful, offering dual-speed connectivity.

D-Link's classic Ethernet kit offers features you won't find in a typical SOHO kit. Sure, it includes a games CD—clearly aimed at the home—but D-Link doesn't wimp out on the hardcore hardware. You get two DFE-540TX 10/100 NICs and a five-port, dual-speed hub that auto-detects line speeds and auto-negotiates different speed connections. It doesn't support full-duplex connections, though.

D-Link includes a 25-user copy of *MidPoint Lite* for Internet sharing. We found no documentation in the box, though, nor an explanation of what the software actually does. We installed it anyway. Setup was painless, and documentation, though cryptic, appeared in an Adobe *Acrobat* file. Basically, *MidPoint Lite* is installed on the machine with the Internet connection, and allocates IP addresses dynamically using DHCP.

Browsers on all machines must be tweaked manually via proxy settings before they can see the connection. Also, the Lite version doesn't allow sharing to machines with static TCP/IP addresses, meaning its integration into an existing environment requires a paid upgrade.

MAXIMUM PC VERDICT

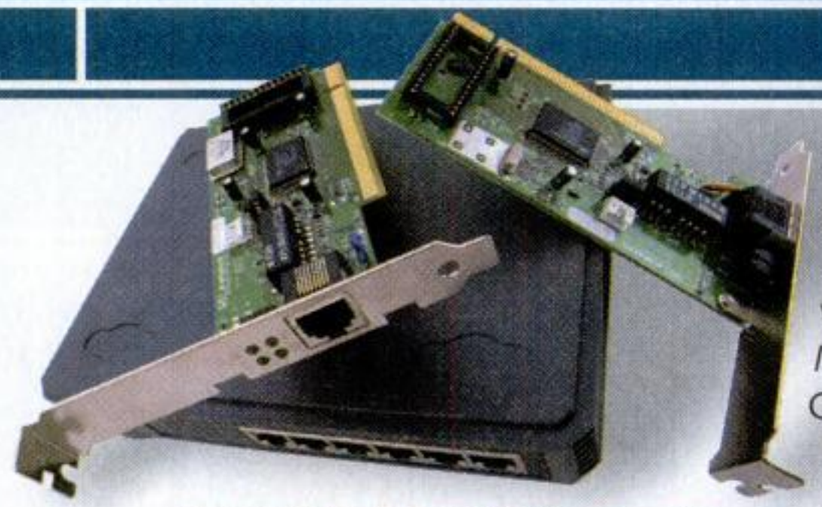
8

Price $139
Company D-Link
Phone 800.326.1688
URL www.dlink.com

Linksys EtherFast 10/100
NETWORK IN A BOX

PLUSES
- Hub supports full-duplex operation
- Internet-sharing software
- Five-port hub with separate uplink
- NICs support both 10/100 speeds

MINUSES
- Lightweight, cheap plastic hub



The only hub here that supports full-duplex transfers along with other amenities.

Linksys bills its EtherFast networking kit as the official networking product of the Professional Gamers' League. Having had our asses whooped by Thresh himself, we know of no more hardcore pack of gamers. The kit includes two 10/100 NICs and a dual-speed five-port hub with separate uplink port. Of all the hubs we tested, the Linksys was the only one that could properly handle both NICs transferring data using full-duplex transmissions. We also had no problems mixing 10/100 topologies, whether running in half- or full-duplex modes, or both. Although the Linksys hub looks the best, its plastic construction makes it feel the cheapest. But it doesn't matter, 'cause it has the right components where it counts.

The EtherFast is backed with a two-user version of *Internet LanBridge* from Acotec. Only one recommendation: Disable the auto-connect feature when gaming. Linksys told us kits will be bundled with an unlimited user license of *LanBridge* starting in August.

We recommend the EtherFast kit above all others.

MAXIMUM PC VERDICT

9

Price $140
Company Linksys
Phone 800.546.5797
URL www.linksys.com

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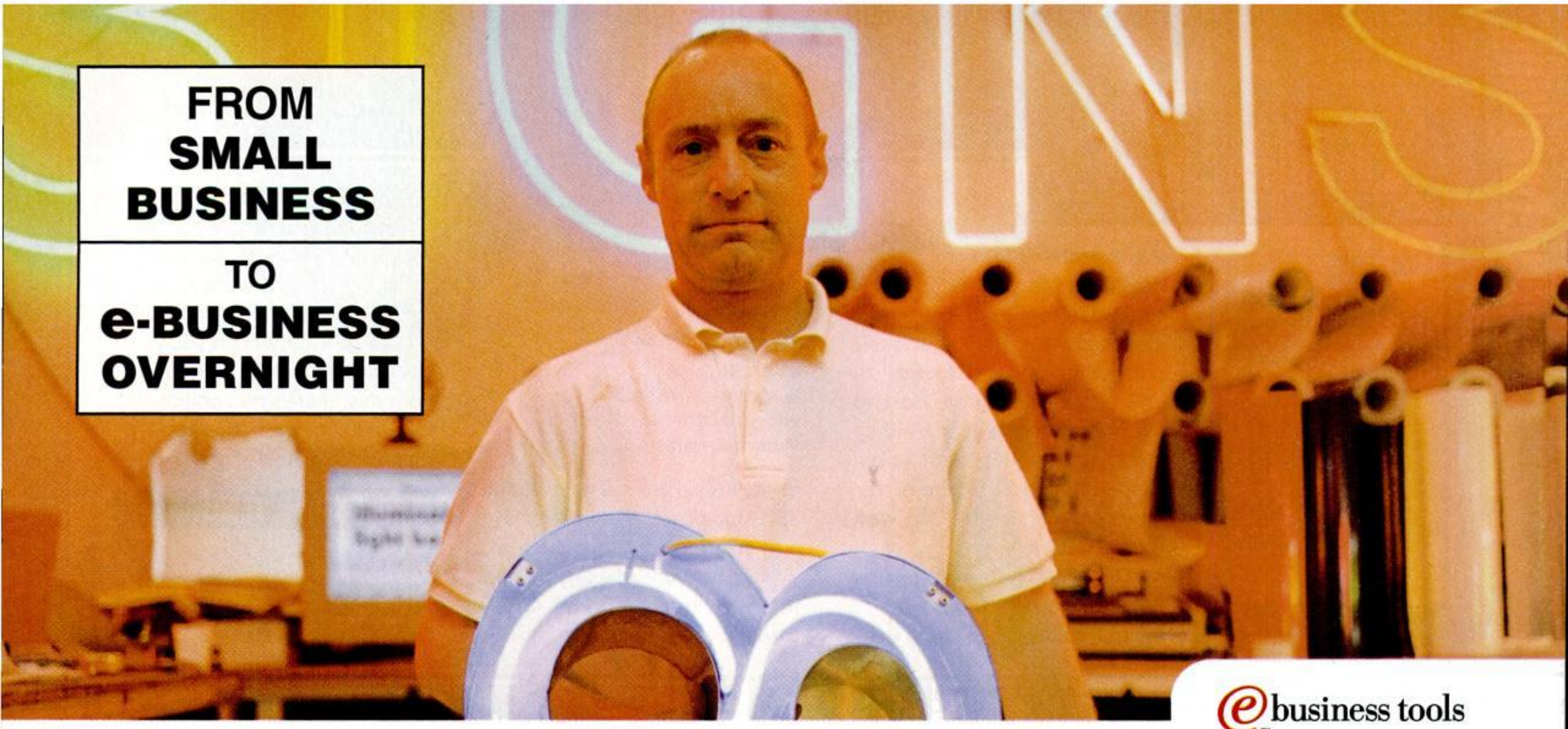

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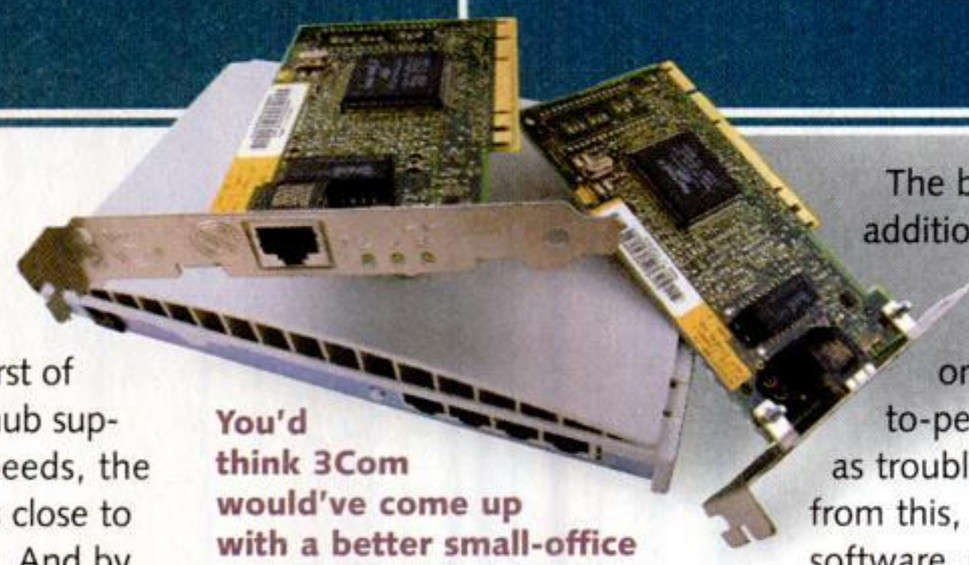
3Com Office Connect NETWORKING KIT

PLUSES
Excellent manual and how-to software

MINUSES
Hub and NICs support only 100BaseT
Hub has only four ports
No Internet-sharing software
Nonstackable hub



You'd think 3Com would've come up with a better small-office Ethernet solution.

We expected 3Com to dominate, but alas, its card was slaughtered. First of all, because the TP400 hub supports only 100BaseT speeds, the OfficeConnect kit drops close to the bottom of the heap. And by including two NICs that also *only* support 100BaseT, 3Com pretty much dropped itself *all* the way to the bottom.

The TP400 hub contains four ports (one of which is a shared uplink), status lights across the front, link lights for the ports, and LEDs for power, packet traffic, and collisions. Neither the hub nor the network adapters support full-duplex operation (all other cards in this kit category do).

The best part of the kit is the additional CD-ROM, dubbed Network Assistant, that contains a tutorial on installing Win95 peer-to-peer networking as well as troubleshooting info. Aside from this, there's no additional software, not even Internet-sharing software.

MAXIMUM PC VERDICT

Price $175
Company 3Com
Phone 800.638.3266
URL www.3com.com

5

Meridian Data Snap! SERVER

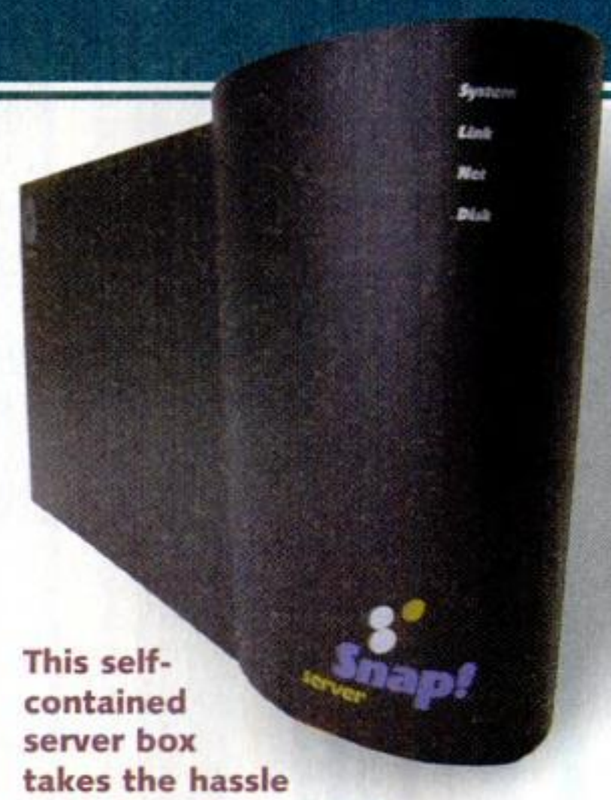
MAXIMUM PC KICK-ASS! product

PLUSES
Great documentation
Simple install
Fastest benchmark times
Very powerful features

MINUSES
Pricey

Meet your future server. It doesn't require a monitor, keyboard, or mouse. It's small, so it can be tucked anywhere, and it consumes only 60 watts of power, so leaving it on is like running a lamp. The Snap! server is so simple and self-contained, it can be considered an appliance—just plug it in and it works.

Packed in the small charcoal case is a PCI-based motherboard, a Pentium 133 CPU, 64MB RAM, an Intel Ethernet 10/100 port, and one or two EIDE hard drives, depending on your configuration. All this is controlled by a Unix-based derivative for embedded appliances developed by Meridian Data. Nonessentials such as video, keyboard, serial, and parallel ports were stripped out, while the rest was optimized for network performance. Only two ports remain: a 10/100 RJ-45 port for Ethernet connection and a power plug.



This self-contained server box takes the hassle out of network admin.

All protocols are enabled so all client machines' Network Neighborhoods automatically see the server once you plug it in. Initial configuration is done using *Snap! Assist*, and once you assign an IP address or enable DHCP, all configuration settings can be executed via a web browser over the Internet (assuming you have the proper rights).

The Snap! server supports TCP/IP, IPX, NetBEUI, NFS, HTTP, and even AppleTalk 2.0 (making it easy to share files between a PC and a Mac). The server supports backup utilities for NT, Netware, and Mac, utilizes NT Domain security, and comes in various sizes: 8GB, 16GB and 32GB (across two drives). Also, dual-drive models can be striped (RAID 0) or mirrored (RAID 1).

At press time, Meridian Data entered into an agreement to be acquired by Quantum, the hard drive manufacturer. We're hoping that their combined might will make Snap! servers cheaper and viable for home networking. For now, this is the perfect SOHO server solution.

MAXIMUM PC VERDICT

Price 8GB: $995; 16GB: $1,795; 32GB: $2,495
Company Meridian Data
Phone 888.343.7627
URL www.snapserver.com

10

The Other Protocols

The Internet's TCP/IP networking protocol is fine for its intended purposes, but two other protocols—Microsoft's NetBEUI and Novell's IPX/SPX—are much faster for sharing data across Ethernet cable. The only real difference between the two is that IPX/SPX is routable, meaning people across the world can see your data with this protocol if you so choose. NetBEUI can only be seen on your local network. We recommend using IPX/SPX only because more games support this protocol. We've also heard that it's faster than NetBEUI.

TIP#2

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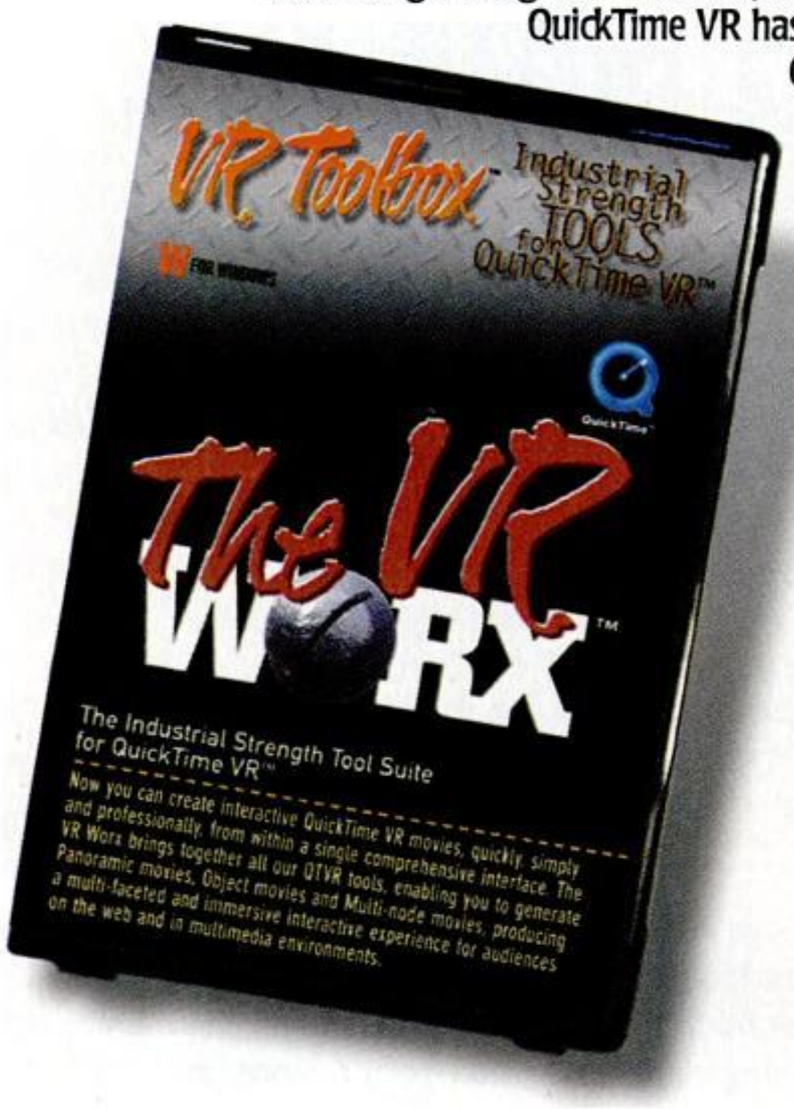
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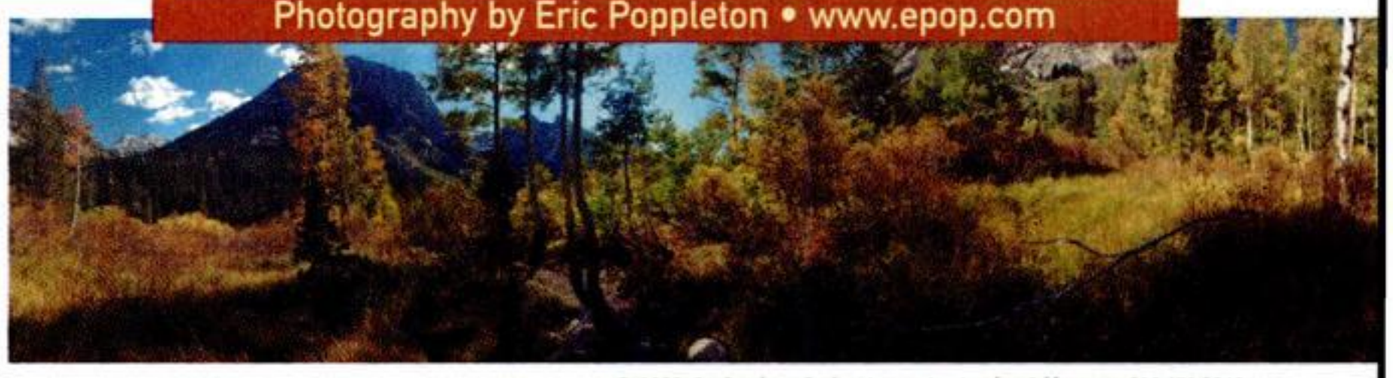
VR PanoWorx™

PANORAMIC

Panoramic movies show the viewer a full 360 degrees vista. The movie is built out of a series of still photographic images, stitched together to form a single flat panoramic image which is wrapped into a barrel and seamed together. The viewer is placed inside, seeing the interior of the barrel as a panoramic vista. The viewer can look left, right, up and down, turning around to see all views of the 360 degree panoramic scene.

Photography by Eric Poppleton • www.epop.com



© 1999, Eric Poppleton Studios, Inc. • Los Angeles, California • 310-471-2845

VR ObjectWorx™

OBJECT

Object movies feature multidimensional views of a particular object. The movie is constructed out of a series of still images (usually 36 for a single band, up to 684 for a full pole-to-pole multiband object movie) which it compiles to create the illusion of a three-dimensional subject. The viewer is given the impression that they are "holding" the object in their hand. They can then rotate it and even tumble it to view all of its sides from any direction.

Photography by Arcamedia • www.arcamedia.com

© 1999, Arcamedia, Inc. • Boston, Massachusetts • 617-624-0101

VR SceneWorx™

SCENE

Multi-node movies are interactive virtual environments, referred to as "scenes," built by combining panoramas, objects, still images and linear movies. Nodes are joined together via linking tools which create hot spots used for navigating from node to node. The resulting movie allows the viewer to "walk" from room to room (each with 360 degree view), pick up and examine objects, watch linear movies and read text or view still images.

Photography by Kelly Bringhurst • www.pbproductions.com

© 1999, Paintbrush Productions, Inc. • St. George, Utah • 435-628-1104

for information on products, pricing and for the reseller nearest you
Call Toll Free 1-877-878-6657 or
E-mail to: sales@vrtoolbox.com

VR Toolbox™ Industrial Strength TOOLS for QuickTime VR™

AVAILABLE FOR: Macintosh™ Windows™

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USB Adapters/ Powerline Networking Kits

Oddballs of the bunch

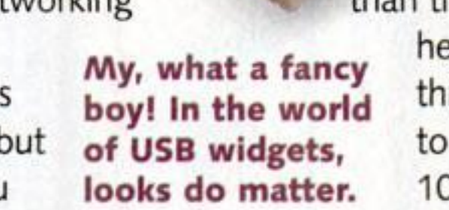
USB network adapters let you join an existing Ethernet network without installing a traditional NIC. One end plugs into your machine's USB port, while the other end connects to an Ethernet RJ-45 jack. Voilà, you're in the loop, and you never even cracked open your case—perfect for notebook connectivity. We review four adapters this month, and all get props for their easy plug-n-play-ability. If your applications don't need a full 100Mb connection, this may be the ticket for you.

We also reviewed a networking "hub" that connects two machines via pure USB protocols. But please note that *all* the USB products this month are limited to half-duplex and non-promiscuous modes. And with USB's theoretical 12Mbps throughput, you should really expect about 5Mbps speeds. Our tests found all the USB products capable of delivering very acceptable file-sharing and multiplayer gaming performance. Don't expect that same bandwidth from Intelogis's PassPort powerline kit.

3Com USB NETWORK INTERFACE

PLUSES
Eagle One–like design
Detachable USB cable

MINUSES
Skimpy manual



My, what a fancy boy! In the world of USB widgets, looks do matter.

We dug 3Com's *Space: 1999* styling and bundled 2-foot USB cable. Tx/Rx and link lights report on networking status. The multilanguage manual is light on tech talk, but tells you what you need to know. Although it was impossible to quantify, we found that multiplayer gaming via the 3Com adapter appeared to offer smoother framerates than the other USB adapters here. Running the 3Com through a crossover cable to a standard 3Com 10/100 NIC let us share files, game, and print without any noticeable problems. While 3Com's Ethernet kit got the thumbs down for performance, the USB Network Interface is fine by our standards.

MAXIMUM PC VERDICT

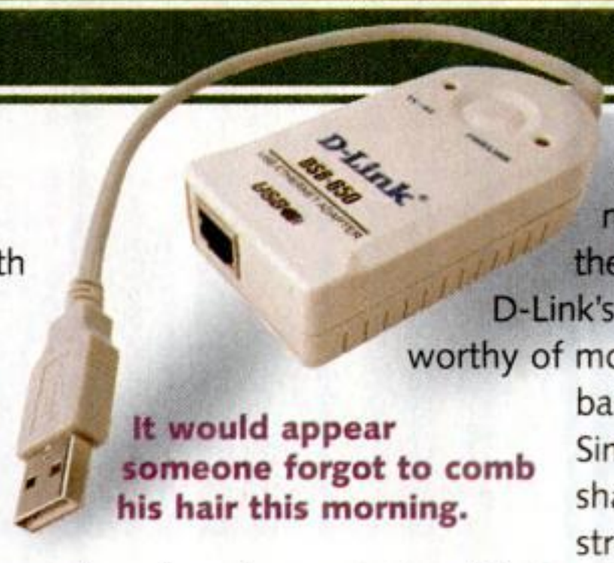
Price $75
Company 3Com
Phone 800.638.3266
URL www.3com.com

8

D-Link DSB-650 USB ADAPTER

PLUSES
It works, doesn't it?

MINUSES
Beat with an ugly stick



It would appear someone forgot to comb his hair this morning.

Butt-ugly and with a nonreplaceable USB cable, the DSB-650 didn't win in the aesthetics category. But looks aren't everything. Turning in benchmark scores within milliseconds of the other products, D-Link's adapter proved worthy of most medium-bandwidth chores. Simultaneous file sharing, music streaming, and printing didn't make it sweat. Although the manual isn't really a manual—it's more of a pamphlet—you won't need it because installation is painless.

MAXIMUM PC VERDICT

Price $59
Company D-Link Systems
Phone 800.326.1688
URL www.dlink.com

8

Entrega USB-TO-ETHERNET ADAPTER

PLUSES
Easy enough for Homer Simpson

MINUSES
Cord not removable

I'm your father, Luke. (Cue heavy breathing.)

Every USB/Ethernet adapter in this roundup installed trouble-free and turned in the same clone-like performance. But then, what's there to install and fret about? It's USB, which is pretty much stable under Win98. Entrega's USB Ethernet adapter is Japanese in its simplicity. A single light that blinks green or red pulses on its purple body. We would have preferred a removable USB cable (to be 86ed in case mice chew through the cord), but otherwise the Entrega turned in a straight-A performance.

MAXIMUM PC VERDICT

Price $69
Company Entrega
Phone 949.859.8866
URL www.entrega.com

8

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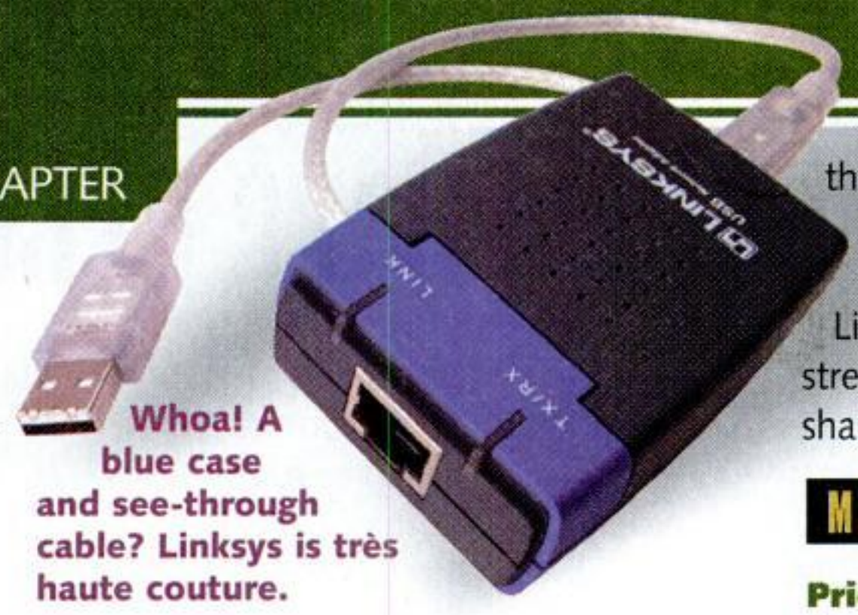
Linksys
USB NETWORK ADAPTER



Whoa! A blue case and see-through cable? Linksys is très haute couture.

Did Linksys intend to sell its USB/Ethernet network adapter to the Mac crowd? The 2-foot, transparent USB cable makes us believe a conspiracy is afoot. Regardless, the Linksys USB adapter performed neck-and-neck with the others here. Linksys includes the most thorough manual, with a helpful glossary at the end. While we perceived some lag during gaming, we couldn't quantify it. The Linksys passed our simultaneous streaming MP3, file-printing, file-sharing test without a hiccup.

PLUSES
- Good docs
- Full set of lights
- Replaceable USB cable

MINUSES
- Clear USB cord—what is this, an iMac?

MAXIMUM PC VERDICT

Price $40
Company Linksys
Phone 800.546.5797
URL www.linksys.com

8

Entrega USBnet
USB-USB ADAPTER

Yes, this little nubby actually serves as a network. We shall call it "Mini Net."

It really doesn't get any easier than this. Connect two machines together via this little USB "hub," drop in the drivers, and your network is up and going at near 10Mbps speeds. The Entrega installation walks you through some networking basics, but you'll really need to familiarize yourself with Windows file- and print-sharing to complete the loop. Noticeably missing from the package is any kind of Internet sharing. But the big caveat with the USBnet is cable length, which is stunted at 15 feet per leg. Unless you're sure you'll never need more length, the USBnet may leave you short.

PLUSES
- Fair speed
- No muss, no fuss hardware install

MINUSES
- Pathetic range
- No Internet sharing

MAXIMUM PC VERDICT

Price $79
Company Entrega
Phone 949.859.8866
URL www.entrega.com

7

Intelogis PassPort
PLUG-IN NETWORK

The Intelogis's PassPort is the slowest device in this roundup. Copying a single 25MB file gave us enough time to heat up a can of soup and flash the BIOS on a neighboring PC. It's slooooooow.

But it's still a neat idea. The PassPort passes network packets through your home's electrical grid. Every room in a house has electrical lines (which isn't the case with phone lines) so you'll never be without network access. The PassPort's range is amazing at up to a quarter-mile. Although there's a lot of questions about the security of electrical-line networks—you do, after all, share unbroken electrical connectivity with your neighbors and the power company—the PassPort allows you to create a secure network to keep others from seeing your data.

Installation is straightforward because the hardware relies on parallel ports. Internet sharing, care of *WinProxy*, supports up to six machines. And the best part is, you can move your printer anywhere within your network and plug it into a wall jack to receive data. Unfortunately, the remote printer node doesn't support bi-directional mode, which means most multifunction printer/scanners are out of luck.

When we tried to net-surf, print, and stream an MP3 simultaneously, the PassPort just didn't have enough bandwidth to pump the MP3.

Powerline connectivity is fancy stuff, but not quite ready for primetime networking.

PLUSES
- Electrical outlets everywhere
- Remote printer node

MINUSES
- Slow
- Parallel device
- Internet clients must be configured manually

MAXIMUM PC VERDICT

Price $200
Company Intelogis
Phone 800.468.3564
URL www.intelogis.com

5

It's Nice to Share

Simply enabling File and Printer Sharing within Network Neighborhood Properties doesn't automatically make your files, directories, or even printers available on the network. You must first share them out manually. This is done by right-clicking on a file or folder, selecting Sharing, and making it available. For printers, go to the Start menu, select Settings, and then choose Printers. Once there, select the printer by right-clicking on it, and select Sharing.

TIP#3

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Networking Technologies: Dare to Compare

Before you throw down for any specific networking technology, consider its pluses and minuses; check the chart below for these details. Elsewhere on this spread we present the nitty-gritty benchmarks and feature sets of each of the 20 products reviewed. It's important to note that in actual practice, none of the different topologies achieved its advertised throughput. If you do the math conversion, for example, you'll see that the SOHOware kit fell way short in the 25MB file-copy test.

CHECK IT OUT Online
www.maximumpcmag.com
Check out Re:Print for details on other throughput misses.

PHONELINE

ADVANTAGES
- Cheaper than Ethernet, powerline or wireless
- Every household has phone line
- 10Mbps phoneline is right on the horizon

DISADVANTAGES
- Speed is currently limited to 1Mbps
- Wiring quality varies; affects performance
- RJ-45 Ethernet port cannot be used simultaneously with RJ-11 port
- Two separate phonelines in the same house cannot be used simultaneously
- Limited to areas with existing phone jacks

WIRELESS

ADVANTAGES
- No wires
- Great for mobile applications
- Plug and Play makes for easy installations

DISADVANTAGES
- Speed is mostly limited to 1-2Kbps
- High-speed 10Mbps wireless is very expensive
- Signal integrity can be an issue
- Limited to 250 feet
- Easily obstructed by enforced walls, wrought-iron railings and microwaves

WIRED RJ-45 ETHERNET

ADVANTAGES
- Best overall speeds from 10Mbps to 100Mbps
- No problems with signal integrity

DISADVANTAGES
- Requires wires to be installed or laid out
- Requires a hub for more than two nodes

POWERLINE

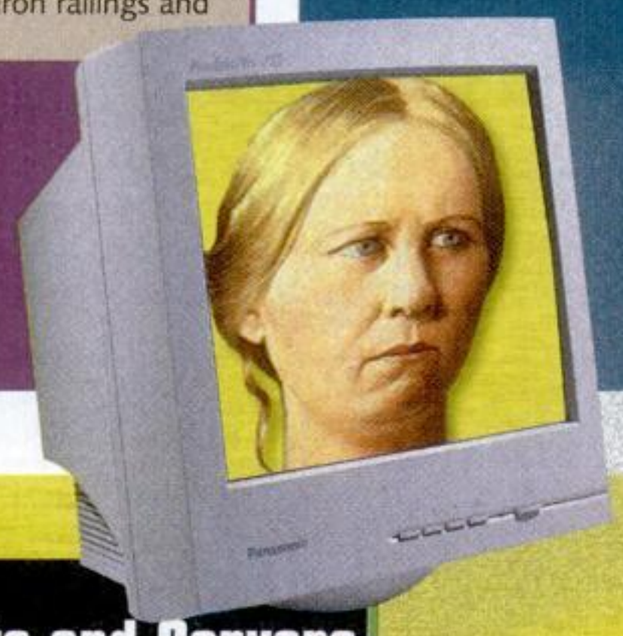
ADVANTAGES
- Every household has a powerline
- Can work up to a quarter mile
- 10Mbps powerline is right on the horizon

DISADVANTAGES
- Speed is currently limited to around 100Kbps
- Anybody on the same power grid can access network
- Some machines may not be seen from all plugs

USB

ADVANTAGES
- No need to crack case to install a card
- Excellent for connecting notebooks

DISADVANTAGES
- Speed limited to 6-8Mbps
- Limited to 30 feet tops
- No support in older systems



on the line Ethernet Networking Kits and Servers

	D-LINK	LINKSYS	NETGEAR	SOHOWARE	3COM	MERIDIAN
KIT NAME	10/100 Network In A Box	EtherFast 10/100 Network in a Box	Network Starter Kit	Fast! Ethernet Starter Kit	OfficeConnect Networking Kit	Snap! Server
Advertised speed (Mbps)	10 / 100	10 / 100	10 / 100	100	100	10 / 100
REAL-WORLD BENCHMARKS	**10 / 100**	**10 / 100**	**10 / 100**	**100**	**100**	**10 /100**
Copy single 25MB file (min:sec)	00:20 / 00:09	00:27 / 00:09	00:26 / 00:10	00:07	00:16	00:25 / 00:05
Copy 122 files (10MB total, min:sec)	00:13 / 00:05	00:13 / 00:06	00:15 / 00:05	00:05	00:09	00:13 / 00:03
Copy 70 files (500K total, min:sec)	00:02 / 00:01	00:02 / 00:01	00:02 / 00:01	00:01	00:01	00:02 / 00:01
SPECS						
Internet sharing max	up to 25 users	Two-user license	N/A	two users	N/A	Unlimited (50 optimal)
Number of ports on hub	5 (with separate uplink)	5 (with separate uplink)	4 (with shared uplink)	5 (with shared uplink)	4 (with shared uplink)	TCP/IP: unlimited (250 optimal); IPX: 250
OS support	Win95/98/NT/ 2000, Windows for Workgroups, NetWare, LAN Manager	Win95/98/NT, Windows for Workgroups, NetWare, DOS	Win95/98/NT, Windows for Workgroups, NetWare, DOS, SCO Unix, OpenServer, Artisoft LANtastic	Win95/98/NT, Windows for Workgroups, LAN Manager, SCO Unix	Win95/98/NT, Netware, Artisoft LANtastic	Win95/98/NT, Windows for Workgroups, MacOS, Unix, NetWare
Kit contents	Two 10/100Mb PCI adapters, dual-speed 5-port hub, two Cat-5 UTP cables (20ft), manual, software	Two 10/100Mb PCI adapters, dual-speed 5-port hub, two Cat-5 UTP cables (25ft), manual, software	Two 10/100Mb PCI adapters, dual-speed 4-port hub, two Cat-5 UTP cables (25ft), manual, software	Two 10/100Mb PCI adapters, 100BaseTX 5-port mini hub, two Cat-5 UTP cables (25ft), manuals, software	Two 100Mb PCI adapters,100Base TX 4-port mini hub, two Cat-5 UTP cables (25ft), manuals, software	Snap! Server, one Cat-5 UTP Cable (6ft), manuals, software
Price	$119	$140	$179	$135	$175	8GB = $995 16GB = $1,795 32GB = $2,495
Verdict	8	9 / Kick Ass	6	7	5	10 / Kick Ass

NOTES: Tested on a Micron Millennia Pentium II 400MHz with 64MB SDRAM, Viper 330, Diamond Monster II, Viking V.90 modem, Epson 900. Tested with 150 feet of RJ-11 cord.

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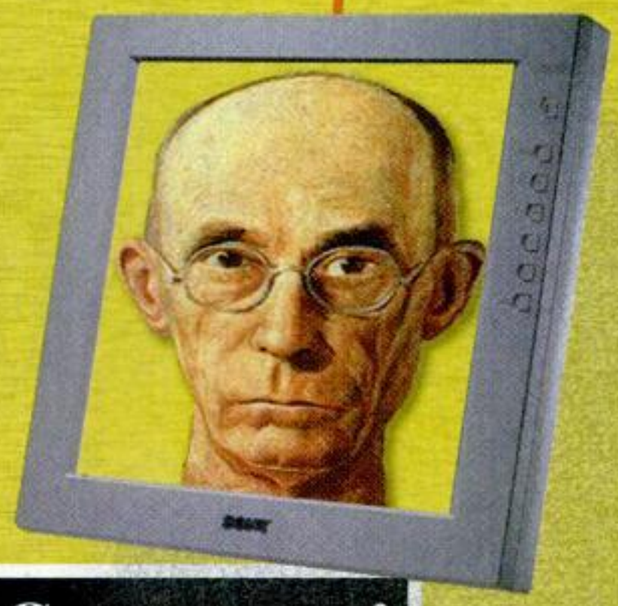
on the line
Wireless Networking Kits

	SOHOWARE	RADIOLAN
KIT NAME	CableFree	CardLink
Advertised speed (Mbps)	2Mbps	10Mbps
REAL-WORLD BENCHMARKS	**CLOSE[1] / FAR[2]**	**CLOSE[1] / FAR[2]**
Copy a single 25MB file (min:sec)	03:37 / 03:58	00:44 / 00:43
Copy 123 files (10MB total, min:sec)	01:36 / 01:41	00:20 / 00:19
Copy 70 files (500K total, min:sec)	00:11 / 00:11	00:02 / 00:02
SPECS		
Frequency	2.4GHz	5.8GHz
Max range	250 feet	120 feet
Max nodes	16	128
Internet sharing max	2	N/A
OS support	Win95/98/NT	Win95/98/NT NetWare
Kit contents	Two ISA cards, two cables, manuals, software	Each card sold separately; manuals, software
Price	Kit: $395 Individual: $199	ISA: $399 PC card: $499
Verdict	9	9

[1] 6-feet apart under optimal conditions. [2] 50-feet apart separated by a wall and a partition.



One Per Customer!

Planning to hand out bandwidth from your cable modem to others? You'll first want to check with your cable provider and/or ISP to see if it's a violation of service. Some providers may actually prohibit you from sharing bandwidth.

TIP#4

on the line
Phoneline Networking Kits

	D-LINK	DIAMOND	INTEL	INTEL	LINKSYS	ZOOM
KIT NAME	Phoneline Network In A Box	HomeFree	AnyPoint Parallel Port	AnyPoint PCI	Phoneline Network In A Box	HomeLAN
Advertised speed	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps
REAL-WORLD BENCHMARKS						
Copy single 25MB file (min:sec)	03:50	03:49	03:57	03:46	03:50	03:49
Copy 123 files (10MB total, min:sec)	01:39	01:38	01:46	01:37	01:39	01:39
Copy 70 files (500K total, min:sec)	00:06	00:06	00:10	00:06	00:06	00:06
SPECS						
Controller	AMD 79C978KC	AMD 79C978KC	Intel 21145	Intel 21145	AMD 79C978KC	AMD 79C978KC
Internet sharing max	25 (6 optimal)	3	Unlimited (6 optimal)	Unlimited (6 optimal)	3	2
Max cable length	500ft RJ-11 328ft RJ-45	500ft	500ft	500ft	500ft RJ-11 328ft RJ-45	500ft RJ-11 328ft RJ-45
Ports	RJ-11 / RJ-45	RJ-11	RJ-11	RJ-11	RJ-11 / RJ-45	RJ-11 / RJ-45
OS Support	Win95/98/NT/2000	Win95/98/2000	Win95/98	Win95/98	Win95/98/NT/2000	Win95/98/NT
Kit Contents	Two cards, phonelines, manual, drivers	Two PCI cards, phonelines, manual, drivers, Unreal SE	Two external network adapters, phoneline, manual, driver	Single PCI card, phoneline, manual drivers	Two PCI cards, phoneline, manual, drivers	Single PCI card, phoneline, manual, drivers, noise filter
Price	$89 two nodes	$99 two nodes, single nodes $50	$189 two nodes, single node $99	$79 single node	$85	$50 per node
Verdict	5	8	7	9	8	7

NOTES: Tested on a Micron Millennia Pentium II 400MHz with 64MB SDRAM, Viper 330, Diamond Monster II, Viking V.90 modem, Epson 900. Tested with 150 feet of RJ-11 cord.

on the line
USB Adapters and Powerline Networking Kits

	ENTREGA	ENTREGA	3COM	LINKSYS	D-LINK	INTELOGIS
KIT NAME	USBnet	USB to Ethernet Adapter	USB Network Interface	USB Network Adapter	USB Ethernet Adapter	PassPort
Advertised speed	6-8Mbps	6-8Mbps	6-8Mbps	6-8Mbps	6-8Mbps	350Kbps
REAL-WORLD BENCHMARKS						
Copy single 25MB file (min:sec)	00:44	00:58	00:59	01:00	01:00	25:27
Copy 123 files, (10MB total, min:sec)	00:22	00:28	00:28	00:28	00:28	10:46
Copy 70 files, (500K total, min:sec)	00:03	00:03	00:03	00:03	00:03	00:40
SPECS						
Internet sharing max	None	N/A	N/A	N/A	N/A	6
Max cable length	15 feet	N/A	N/A	N/A	N/A	N/A
OS support	Win98/95b	Win98/95b	Win98	Win98	Win98	Win98/95
Kit contents	USB connector and two USB cables	USB network interface with cable, drivers	USB network interface with cable, drivers	USB network interface with cable, drivers	USB network interface with cable, drivers	Two network nodes, one printer node, drivers, cables, two surge protectors
Price	$79	$69	$75	$40	$59	$200
Verdict	7	8	8	8	8	5

NOTES: Tested on a Micron Millennia Pentium II 400MHz with 64MB SDRAM, Viper 330, Diamond Monster II, Viking V.90 modem, Epson 900. Tested with 150 feet of RJ-11 cord.

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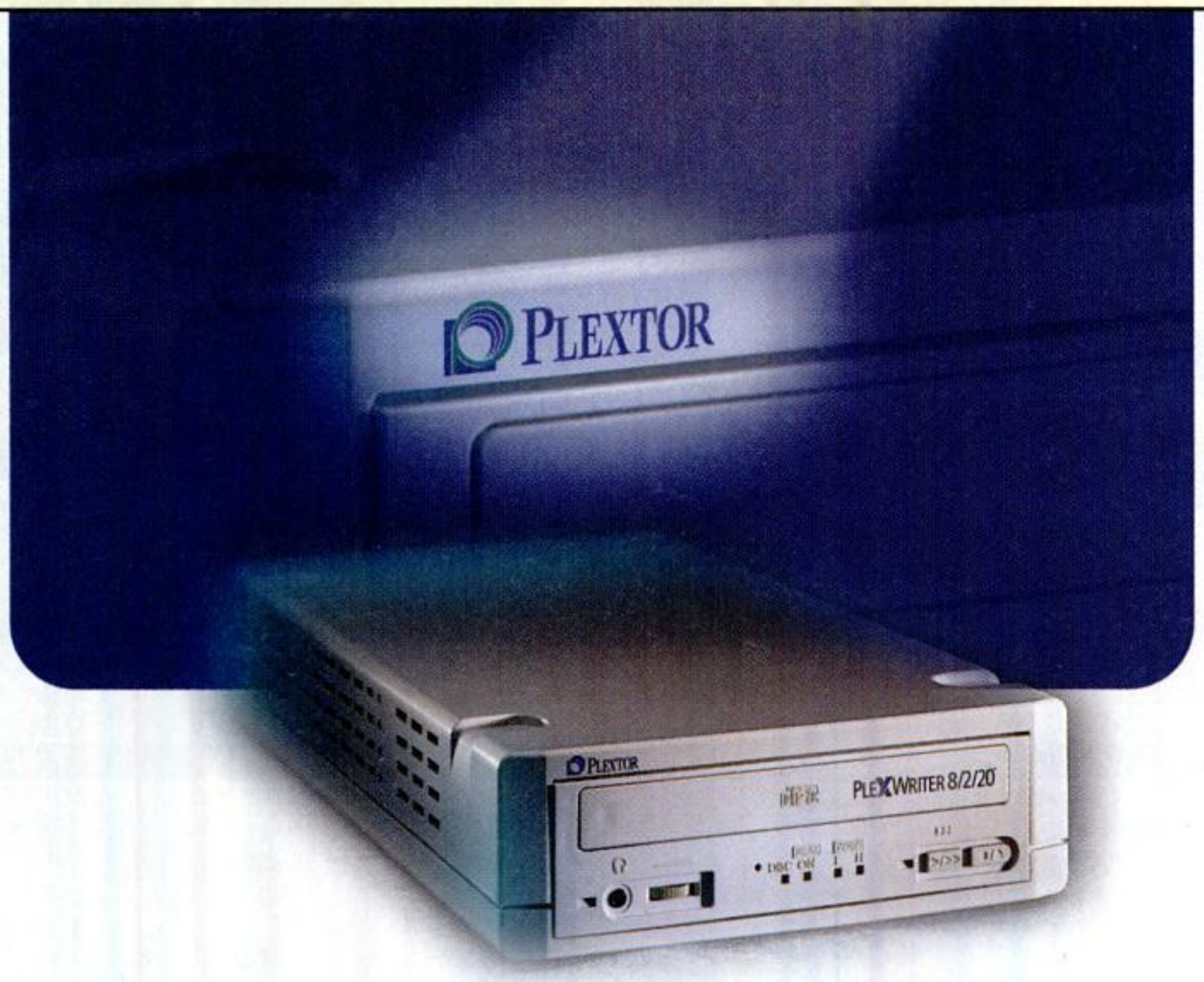
PlexWriter 8/2/20 CD-RW Drive

Quality. You've got our name on it.



Introducing the new 8X CD-ReWriter. Best in class record speed. Best of Plextor.

PlexWriter 8/2/20 CD-RW ReWriter Drive. It's the fastest of the fast. The latest high-performance archivist from the name that's synonymous with quality and reliability. Plextor.

With our multi-talented 8X Write and 2X ReWriter, you don't have to sacrifice CD-R performance to get CD-RW's ease of use. And, because it doubles as a hard-working 20X CD-ROM drive with 170ms access–it's three drives in one–not to mention one tough shell. An outstanding replacement for your outdated CD-ROM drives.

Archive up to 74 minutes of data in under 10, with drag and drop simplicity. And write without failure thanks to enhanced features like fool-proof media recognition that automatically adjusts power and burn time, fast SCSI burst rates, vibration dampening, superior cooling action, and a bigger-than-life 4MB buffer.

Bundled software supports CD to CD-R direct duping, digital audio capture/playback over SCSI bus or network, and Plextor CD Res-Q Hard Drive Disaster Recovery Software for total hard drive recovery from a bootable CD.

For reliability you expect at speeds that exceed, there's only one choice from the one and only. The new PlexWriter 8X CD-RW from Plextor. Now available with plain or black bezel.

PLEXTOR
Don't Settle For Less

What's in a name? Call 800-430-5040, or visit http://www.plextor.com/contest/8220maxpc.html–enter to win a PlexWriter 8/2/20.

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DIGITAL HOLLYWOOD

MOVE OVER, QUENTIN, THE NEXT WAVE OF FILM MAKING HAS ARRIVED

ILLUSTRATION BY J.J. ABBOTT

BY RICK POPKO

Making movies on your PC has never been easier. Thanks to a slew of affordable new products, anyone with a camcorder, decent PC, and inexpensive video-capture device can produce exciting, indie-caliber video productions. Witness the story of "South Park" creators Trey Parker and Matt Stone. With their own desktop computers, they produced the hilarious "Spirit of Christmas" as a joke, but it spread around the Internet like wildfire. Today Trey and Matt have their own series on Comedy Central and a South Park feature film—plus they're richer than God!

You too can be a desktop mogul. If you want to capture live action, you can eschew analog-to-digital conversion entirely and shoot your scenes with a digital video camera. DV cameras are great because they capture your content as a series of ones and zeros, which can then be easily transferred to your computer without a noticeable degradation in picture quality. In fact, you can stray as many as 15 generations from your master DV tape without losing your original luster. Try doing that with your VHS or Hi8 tapes.

We have reviews of four hot DV cameras, along with the 411 on what's important when selecting a good one. We'll also take a look at two MPEG-1 encoders that spit out the same quality video you see in CD-ROMs of pirated feature films. These devices are inexpensive, and you don't have to open your case to install one. We conclude your DV internship with a tutorial on one of the coolest cinema effects ever.

The digital video revolution is here, people. It's time to take up arms—er, cameras—and start creating movies that'll show Hollywood you don't need $40 million to make a movie.

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Sony TRV103

MAXIMUM PC KICK-ASS! product

Sony's DCR-TRV103, using the new Digital 8 format, is the most exciting camera to come around in a while. The TRV103 records digital video to regular Hi8 tapes (ergo "Digital 8"), which are far less expensive—$5 for 90 minutes compared to $19 for a 60-minute miniDV tape. Additionally, the TRV103 plays back both 8mm and Hi8 tapes, a great advantage to anyone currently using an analog camera but wanting to enter the world of digital video.

OPTICAL ZOOM	20X
DIGITAL ZOOM	360X
CCD	460,000 PIXEL
LENS	1 INCH
TAPE	8MM

The TRV103's coolest feature is its analog-to-digital converter, which lets you digitize all your analog videos to Digital 8, then shoot the footage into your computer via FireWire. Sony sells a stand-alone box that does only this, for about $500.

What really drives this Kick Ass product home is its incredibly low price—less than $900. With this camera, a P-II 300MHz system with a fast hard drive, and something like the ADS Pyro—a $179 FireWire capture board with editing software—you can practically start your own production company.

The camera is packed with features. NightShot is great for shooting in no-light situations—it's like having a set of night-vision goggles. Power-saving features let you record up to 10 hours on a single battery charge (if you're not constantly switching from camera to playback mode and using the flip-out color LCD). Other accoutrements include an amazing 360x digital zoom, fade in/out, a 16:9 aspect ratio, remote control, and manual/auto focus.

Sony's TRV103 is like the Swiss Army Knife of DV cameras. There are so many features on this thing, it would take two pages to list them all.

The camera's only drawbacks are its B&W viewfinder, size, and weight. The TRV103 is by far the bulkiest and heaviest camera in this roundup.

We were surprised by the TRV103's fine picture quality. We assumed that Digital 8 cameras had to do something funky under the hood in order to record digital information to regular-old Hi8 tape. But the Sony came in an almost indistinguishable second to the Panasonic in terms of overall picture quality. The Panasonic appeared to be using a more sophisticated anti-aliasing algorithm that helped blend fine lines and smooth out artifacts.

Comparing price, performance, and features, we have to give Sony kudos for developing a consumer video camera that could put Hi8 and VHS on the endangered list.

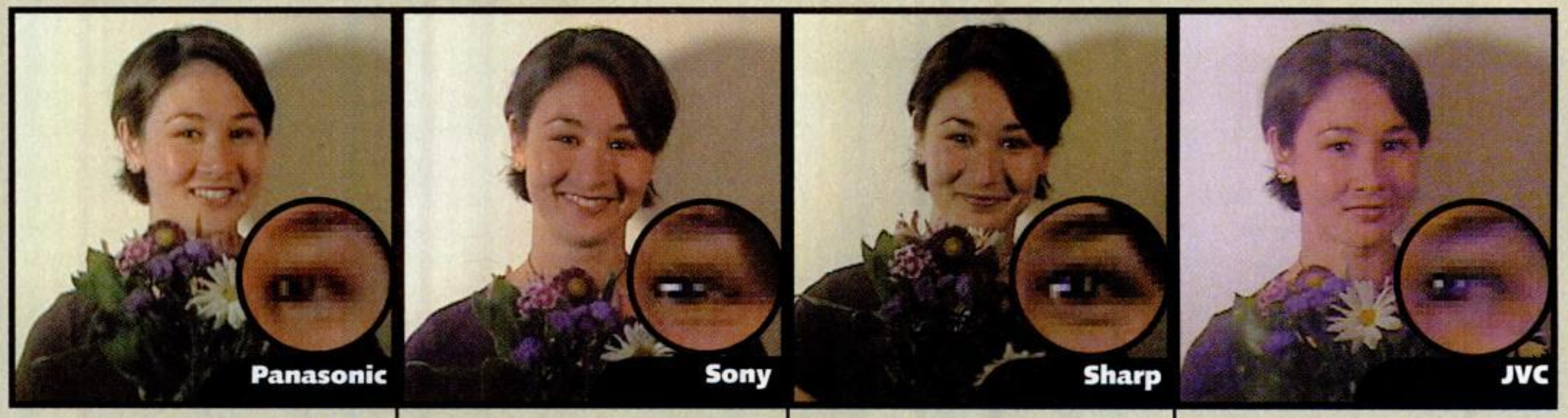
MAXIMUM PC VERDICT

Price $889
Company Sony
Phone 800.342.5721
URL www.sel.sony.com

9

PICTURE QUALITY: DIGITAL STILLS

The following photos were shot in a controlled environment using studio lighting and a locked down tripod. All the cameras were set to auto focus and auto white balance. To give each camera the benefit of the doubt, we took several photos of our model and chose the best. After careful analysis, two independent judges crowned Panasonic the winner, with Sony coming in a close second. The Sharp was good for third, and JVC finished in a very distant last place.



Panasonic uses heavy anti-aliasing to achieve a smoother picture, and the colors are much more natural looking.

A slight red color cast and very slight compression artifacts were the only things that marred the Sony's results.

Sharp's picture was noticeably darker and the image compression created dark lines around the edges.

Heavy mottling marred JVC's image, which produced an inordinate amount of random patterns and false data.

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Panasonic PV-DV910

At three inches, the LCD on the PV-DV910 is the largest and clearest of the four cameras we looked at. With great color reproduction, the camera also boasts the best image quality. Sure, it uses heavy anti-aliasing around edges and between fine lines, but sometimes the omission of detail can impart the illusion of sharpness.

The camera offers standard features such as telephoto, wide angle, mic-in, playback controls, still-photo mode, and the ability to send your video back to a VCR or television. But if it's bells and whistles you're after, go elsewhere. Its few stock effects include basic fade in/out, sepiatone, negative, black and white, and solarize. Solarize is the weakest effect and quickly becomes cliché.

OPTICAL ZOOM 18X
DIGITAL ZOOM 300X
CCD 460,000 PIXEL
LENS 1 INCH
TAPE MINI DV

Panasonic's PV-DV910 has excellent picture quality, but a lackluster feature list.

You can run two DV910s off the same remote control device, which is a godsend if you're directing a two-camera setup. We should also note that the DV910 was one of the noisiest cameras in the group, so you won't be able to sneak shots in quiet places.

If this camera had a built-in analog-to-DV converter like the TRV103, it would have challenged Sony for the top spot.

MAXIMUM PC VERDICT

Price $1,400
Company Panasonic
Phone 800.211.7262
URL www.panasonic.com

8

Sharp VL-PD3

Like Panasonic's DV910, Sharp's VL-PD3 is feature-frugal. The camera does a 16:9 aspect ratio for letterboxing your flicks. But talk about missing features: There's no mic-in, no light indicator in the front of the camera to let your subject know the tape is rolling, and no built-in analog-to-DV converter. The camera's two meager visual effects are mosaic and sepia. Oddly, these effects are not applied to the tape during shooting, but activated when you play your video back to TV using the camera's remote control. Other features are fade in/out, and still-picture mode.

The camera's most unique feature is the multiple-strobe recording mode, which takes a series of 16 pictures at 0.1-second intervals—cool if you need to figure out how something's done one frame at a time.

As for picture quality, the VL-PD3 comes with a generous 660,000-pixel CCD. Unfortunately, that quality is drastically impeded by the small .75-inch lens. In our image tests, Sharp ranked third behind Sony, with a slightly darker image than the other cameras. We also saw slight compression artifacts and a heavy edge line around objects.

OPTICAL ZOOM 10X
DIGITAL ZOOM 100X
CCD 660,000 PIXEL
LENS .75-INCH
TAPE MINI DV

Sharp's VL-PD3 has fewer features than the DV910, but the PD3's VCR controls are better.

MAXIMUM PC VERDICT

Price $1,600
Company Sharp
Phone 800.237.4277
URL www.sharp-usa.com

7

JVC GR-DVM50

JVC's CyberCam DVM50 was the most compact and portable of this roundup, but also had the worst image quality, distinguished by heavy mottling. Like the Sharp, the CyberCam has a .75-inch lens and no mic input. Standard features include a 16:9 aspect ratio, 200x digital zoom, and the ability to record a 1/3-second clip for animation-like shots. Unfortunately, the camera doesn't do stop-motion animation.

The CyberCam comes with a film-like effect that had us ready to reach for the popcorn and Red Vines. Regrettably, the picture jittered too much and the grain it added looked phony. Ghost, another cheesy effect, makes everything look like an LSD documentary. The camera's most original feature is the built-in JLIP control that lets you attach the camera to your computer's serial port and transfer pictures and video to your hard drive.

You'd think the CyberCam's size would be a plus, but the camera actually feels awkward to hold. We kept thinking our fingers were going to slip over the lens opening. This is a good camera for slipping into your pocket, but don't even consider it if you're looking for high picture quality.

OPTICAL ZOOM 10X
DIGITAL ZOOM 200X
CCD 680,000 PIXEL
LENS .75-INCH
TAPE MINI DV

We liked the size of JVC's GR-DVM50, but it delivered the worst picture quality of the group.

MAXIMUM PC VERDICT

Price $1,499
Company JVC
Phone 800.252.5722
URL www.jvc.com

5

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpcmag.com.

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MPEG-1 ENCODERS

Pinnacle Systems StudioMP10

The StudioMP10 is a complete MPEG-1 encoding system, replete with an encoding box and editing software. It's easy to install and configure, and includes myriad transitions, great titling capabilities, a sound-effects library, and a royalty-free music-generating program.

The StudioMP10 lets you manually adjust your video-capture data rate—higher is better. It can also output your creations back to VHS video, though the image quality of back-to-tape leaves a lot to be desired. This product, like the Dazzle DVC, is best used for creating videos for CD-ROM, e-mail, and the web.

ENCODES MPEG-1
INPUTS COMPOSITE/S-VIDEO/RCA AUDIO
OUTPUTS COMPOSITE/S-VIDEO/RCA AUDIO
EDITING SOFTWARE SMARTSOUND/VIDEO SPICE RACK LITE
DIGITIZES 30FPS
MAX CAP RES 352X240

Pinnacle's editing software helps you easily weave all types of media into your finished project—video clips, still images, sound effects, narration, music, and titles. Each category is displayed as a tabbed page that can be dragged into your media timeline. Dissolves, wipes, and titles can be configured to any duration.

The MP10's CD-mastering software is the best way to burn your masterpieces onto CD-ROM.

Audio waveforms are shown below each clip, and audio nodes can be placed, raised, and lowered for precise volume control. The built-in audio mixer lets you sweeten and sync your tracks.

The MP10 is best used for MPEG-1 encoding, but it can also compress your projects using the Indeo, Cinepak, Vivo, and ClearVideo codecs.

What sets the MP10 apart from the DVC is Pinnacle's original CD-burning software, which lets you create semi-interactive CD-ROM titles. The software lets you import your own background, place buttons onto it, and link them to various videos or parts of videos. We can't wait until they ship the MPEG-2 version of this!

With music, titles, transitions, and a menu maker for CDs, StudioMP10 is a cool and comprehensive solution.

—Beverly Bartone

MAXIMUM PC VERDICT

Price $269
Company Pinnacle Systems
Phone 650.526.1600
URL www.pinnaclesys.com

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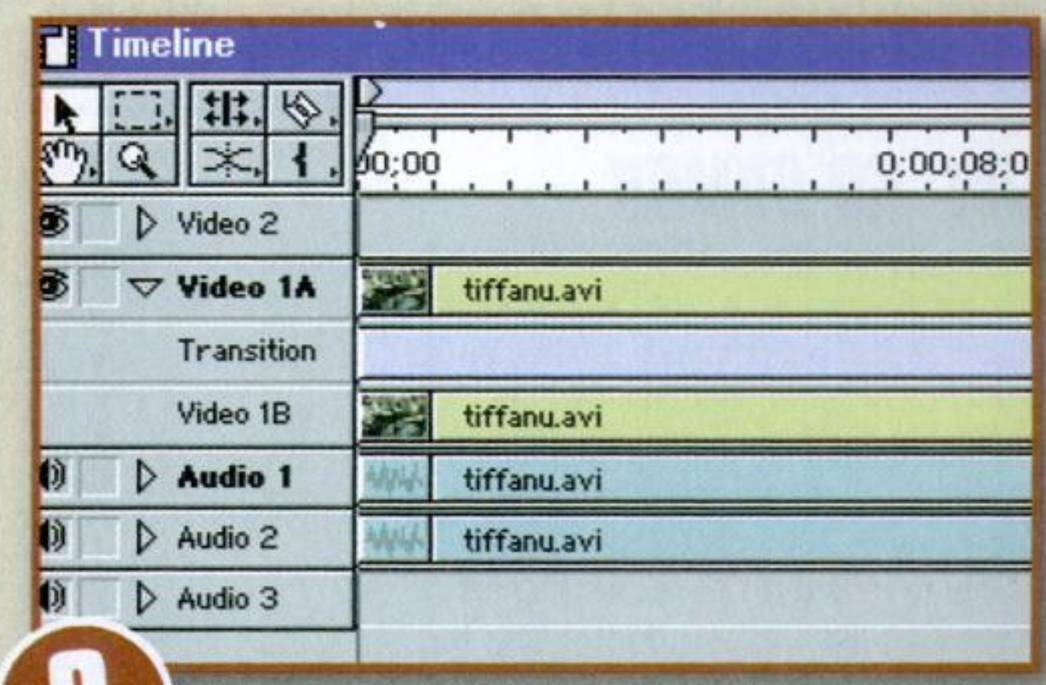
HOW TO MAKE A DEAD RINGER

Remember the "Brady Bunch" episode in which Alice's "cousin" came to visit? Essentially, we witnessed two identical Ann B. Davae, side-by-side, in the same shot. The effect is easy to pull off with Adobe Premiere. All you need is a willing actor.

1 Put the camera on a tripod, look through the viewfinder, and gauge the scene's halfway point. Place your actor on the left and tell her not to cross over the imaginary halfway point. Roll camera and have your actor deliver lines to a stand-in actor. While the camera's still rolling, have the "real" actor quickly change places with the stand-in. The real actor should now pretend to listen to the first line and then respond. Cut. Now digitize the footage, but instead of digitizing the entire clip as a single file, stop between the dialogue break and create a second file of the response dialogue.



2 Launch Premiere, open the captured video clip of the first bit of dialogue, and drag it onto track A of Premiere's timeline. Repeat the process with the second clip of dialogue, only drop it onto track B right underneath track A. Your Premiere window should look like the screen above. Now open your transitions window, select Clock Wipe, and drop it on the transition track between A and B. Stretch it so that it goes from the beginning to the end of the clip. (In the screen above, the transition track appears in light blue between the yellow video tracks.)

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Dazzle Multimedia Digital Video Creator

Dazzle's Digital Video Creator, like the Sudio MP10, is an all-in-one MPEG-1 studio. In fact, the two kits use the same C-Cube encoder chip. But while the MP10 is a parallel device, the DVC uses USB, so you'll need Windows 98.

For video applications, the benefit of USB over parallel is that it's less taxing on the CPU, which leads to better playback performance on slower machines. Another plus is the DVC's dedicated MPEG-1 playback chip, which enhances quality when sending video out to tape. But while the picture quality of the DVC's out-to-tape is better than the MP10's, it still looks worse than a second-generation videotape.

ENCODES MPEG-1
INPUTS COMPOSITE/S-VIDEO/RCA AUDIO
OUTPUTS COMPOSITE/S-VIDEO/RCA AUDIO
EDITING SOFTWARE SMARTSOUND/PHOTO-EXPRESS & VIDEOSTUDIO
DIGITIZES 30FPS
MAX CAP RES 320X240

Dazzle's GUI is easy to understand and comes with software to get your videos on the web.

Although the DVC's video-editing functions are limited—no transitions, audio control, or titling—the kit does come with Ulead's *Video Express* for video editing, and *Photo Express* for still-image manipulation.

The DVC comes with a painfully obvious GUI. In fact, its toy-like interface is too simple for our taste. The main window is shaped like a palm-top, and drawers pull out to float by themselves. There are clearly labeled buttons for capturing video, stills, and audio; pullout drawers for editing and media storage; and a clever thumb-wheel for volume control. Press the Publish button, and you'll create an instant web page with your current video project in it.

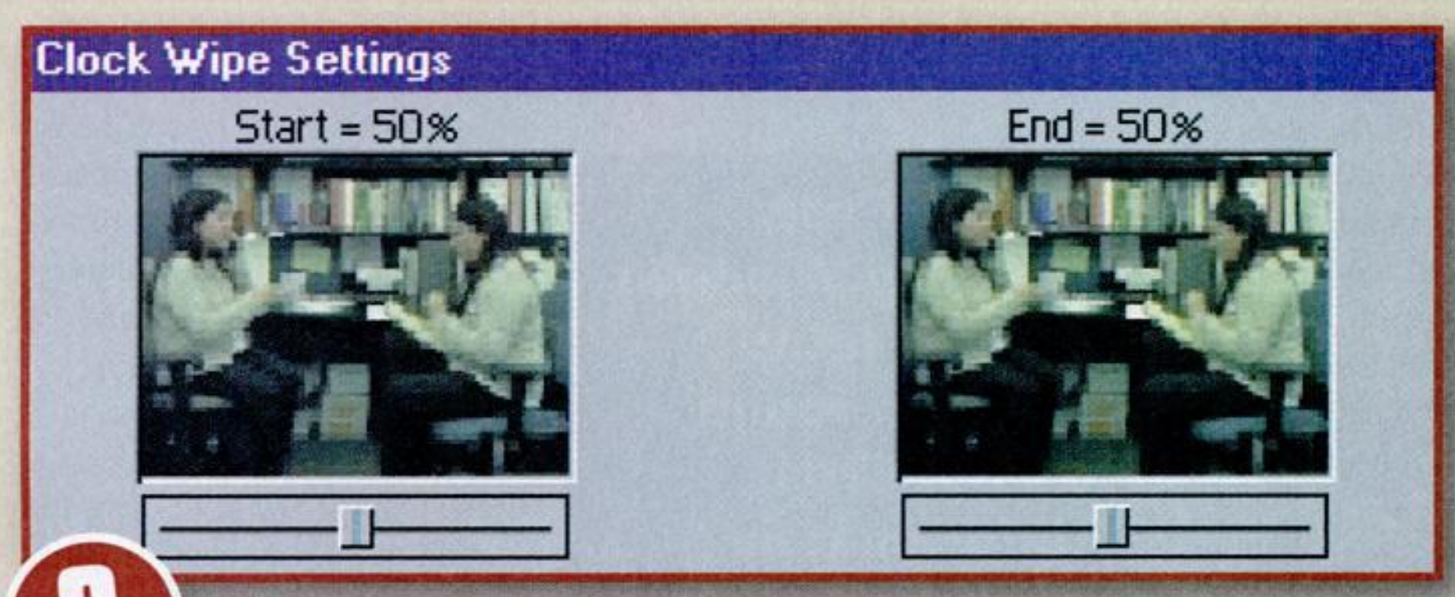
Getting your new page onto a server is easy, too, because Dazzle, RealMedia, and GeoCities have collaborated to offer server space for as low as $5 monthly. Generally speaking, between the two products, the MP10 is the best kit for burning MPEG-1 to CD-ROM, and the DVC is best for slapping video to the web.

—Beverly Bartone

MAXIMUM PC VERDICT

Price $249
Company Dazzle Multimedia
Phone 510.360.2300
URL www.dazzle.com

8



3 Double click on the transition track. This will bring up the Clock Wipe window. Check the Show Actual Sources box. Depending on how you set up the split screen, you might also have to toggle the Up-and-Down arrow to remove the dummy actor from the shot. Move the sliders under the monitor windows to 50%. At this point you should be seeing the double.

4 Build a preview of your project by hitting Return. Then render the project out as you would any other movie. In our case, to fit the movie on CD-ROM, we chose to use the Cinepak codec at 320x240. Here's a frame from the final clip.

RICK'S TIPS

To get the most out of the Dead Ringer trick, consider the following:

- To get fluid dialogue between the "different" actors, mark where dialogue begins and ends with a sound you can edit out later. This will help you in post-production to sync the dialogue.
- Have someone sit opposite you in the scene, which helps with eye contact and general fluidity. That person can even speak your dialogue in each half; you can clip their words out later.
- Shoot in a totally controlled lighting environment. If the light changes even a fraction, you'll have a noticeable line between your two halves, ruining the effect. It's best to shoot indoors at night.
- Don't turn the camera off between halves. When you turn the camera off and on, you could get a different white-balance reading, which would slightly alter your colors, ruining the effect.
- Make sure your camera is on a tripod, and your background is absolutely stationary.

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Ask the Doctor

Symptom | Diagnosis | Cure

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to **doctor@maximumpc.com.**

This month:

- Too much emulation can make you go blind
- Going SCSI after a period of inactivity
- Boot sector viruses and the methods that clean them
- Souping up your Voodoo³

CHECK IT OUT online
www.maximumpcmag.com
Check out the Free Cllinic for tech advice from editors and readers.

Master Blaster

How do I get rid of Sound Blaster emulation? Who needs it? I could do without additional IRQ overhead. Can you please help me out?

—Tim Lutz

Yeah, who needs Sound Blaster emulation anymore? It's really just for old DOS games, so you shouldn't be tying up the extra resources if you don't play anything in DOS. Though you didn't indicate which soundcard you have, I'm assuming it's a PCI card.

If your soundcard's Control Panel settings don't offer the option to disable DOS support, you can get rid of it in the Device Manager by selecting the "disable in this hardware profile" option in the Sound Blaster emulation properties. Depending on which card you have installed, you may also need to REM out the line that starts up the DOS support in your AUTOEXEC.BAT.

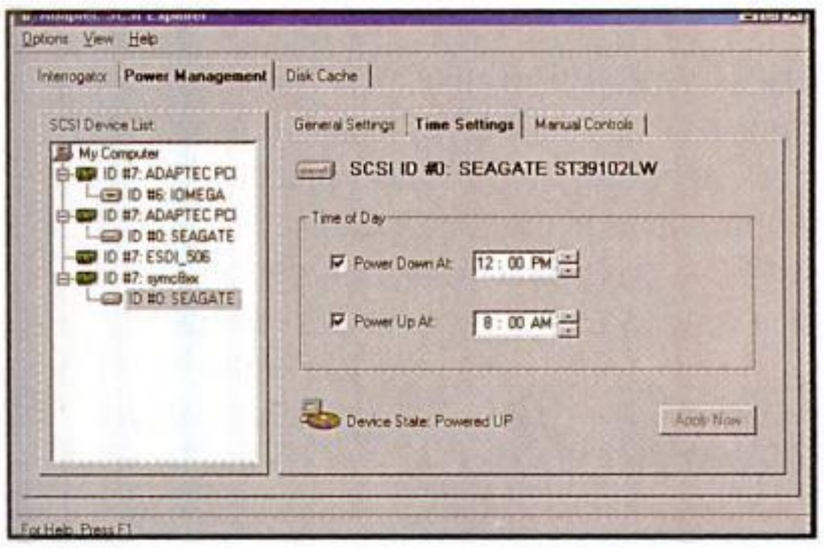
Power Lulls and SCSI Lovers

I just love my new IBM SCSI hard drives, but I'm unable to locate the power-management setting that spins them down after a period of inactivity. When I had IDE there was an option in the Power Management Control Panel, but now that option doesn't show. Changing settings in BIOS doesn't help either, and there's no option in the SCSI BIOS. Is there a utility from Adaptec? Adaptec and IBM seem to be very difficult to reach, and I have already spent too much time scouring their web sites.

—Robert Henke

Motherboard BIOSes, SCSI BIOSes, SCSI hard drives, and Windows have always had problems with power management. Whom the blame rests with depends on who's talking. Kick-Ass motherboards such as the Asus P2B-2 offer full support for Advanced Configuration and Power Interface (ACPI), which specifies how software and hardware communicate with regard to power usage. However, I'm not so sure you'll find ACPI support in your hard drive.

Regardless, it sounds as though you've covered the bases, and obviously your drives are still powering down. You might try Adaptec's *EZ-SCSI 5.0*—it offers great power-management support that lets you specify individual settings for each drive, based upon mouse and keyboard usage and time of day. You can also manually power down devices. What's the catch? While *EZ-SCSI* supports most SCSI drives



EZ-SCSI gives you complete control over your peripherals' power.

and devices out there, it's not free. But if complete control of your SCSI devices, via nice utilities and descriptive dialogs, is important to you, then laying down $40 to $50 shouldn't be a big deal.

My MBR is Fubar

While I was installing Windows 98, the setup program found a boot virus that *Norton AntiVirus 4.0* never found. Unfortunately, I don't know how to clean my boot sector. Now when I use my PC, my screen freezes, the mouse doesn't respond, and the "Crtl-Alt-Del" key combo is useless. Naturally, this happens at the most inconvenient times.

I believe that my computer is infected with the "Forms" virus. From what I've read, it's usually found in the boot sector and is 2.7K long. Do I need to wipe my hard drive to get rid of this bugger? Do you know of any product that will safely clean the boot sector of my hard drive?

—FEDD

> **"While I was installing Windows 98, the setup program found a boot virus. Unfortunately I don't know how to clean my boot sector."**

A boot-sector virus is a royal pain in the ass, but all you need to evict the little bugger is a little patience and some late-model anti-virus software, such as *Norton AntiVirus 5.0* or *McAfee VirusScan 4.03*. Both packages offer a bootable rescue disk, which is what you'll need in order to get rid of that boot-sector virus. Just do a clean boot (power your PC off instead of restarting) from the rescue disk and let it run a full scan of

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your hard drive. The first thing the scanner should do is check your boot sector and correct any problems it finds. Hopefully, it will nab the little nasty residing there and rectify any damage it caused.

I say hopefully because—and this may come as a shock to some people—anti-virus software doesn't always find viruses. You see, viruses are designed *not* to be detected by software, and sometimes they are designed successfully. I'm not saying it's hopeless to try ridding your computer of viruses, just that anti-virus software is not always 100% effective. With that said, it's safe to say that most late-model anti-virus software should be able to root out the worst offenders and salvage any damaged files.

We don't recommend cleaning out boot-sector viruses using DOS utilities such as format and FDISK. Formatting a hard drive may remove viruses located in the boot sector, but won't touch viruses that have infected the MBR. FDISK takes more of a shotgun approach by deleting the old partition table and replacing it with a new one, but this doesn't guarantee the removal of viruses that are operating through other parts of the partition sector. And even though FDISK/MBR wipes everything but the partition table in the sector, it still doesn't always get its man, since some particularly nefarious viruses actually encrypt and relocate the partition sector.

Rediscovering the Magic

I recently repartitioned my 11GB hard drive using *PartitionMagic 3.0*. After it was done resizing my partition, I had it make a new partition. Some selection screens popped up, but after reading the first one and not knowing what it meant, I decided to go with the defaults on all the screens. Now I can't access the part of my hard drive that I tried to make into a new partition, and neither FDISK nor *PartitionMagic* will touch that partition. I keep getting an error about the FAT being the wrong size. I've tried wiping all the partitions with FDISK, but there isn't a way to remove the bad partition without having access to it.

Is there anything I can do? I've only lost about 800MB, but I miss them.

—*Andy Ring*

Since I'm a general practitioner, I referred your question to specialists at PowerQuest. Here's what they had to say:

Andy may be running into drive size limitations, since *PartitionMagic 3.04* and earlier only recognize up to 8GB of the hard drive. While *PartitionMagic 3.05* sees the full drive size, it won't resize a FAT or FAT32 partition past the 8GB boundary. (FYI, *PartitionMagic 4.0* doesn't have any drive size limitations.)

His partitioning problems could also be due to *PartitionMagic's* interaction with anti-virus software, some of which (notably older versions) views changes made to the MBR by *PartitionMagic* as the work of a virus. After rebooting to implement *PartitionMagic* changes, the anti-virus software will detect that virus-like activity has taken place (a write to the MBR, partition boot sector, or FAT) and will prompt you to repair, inoculate, or ignore the problem.

If you allow the anti-virus software to repair the changes made by *PartitionMagic* you may end up with an inaccessible or corrupt partition because the anti-virus software has fixed something that isn't broken.

Since it is a new partition, it can be deleted and re-created without too much trouble—if Andy could access it. To address this problem, we offer a partition table editor on our web site called PTEDIT.EXE that he can use to zero out a partition table entry, manually deleting the partition. Once that's done, Andy should upgrade to *PartitionMagic 4.0* so he can get full support for his large drive.

My Voodoo³ is now running at 187MHz. After some benchmarks, I'm going to try for 190 or more!

second opinions

READERS SHARE THEIR HOME REMEDIES

Put on the red light

When I saw the letter in the July 1999 issue describing the loss of red images on an HP Ergo Ultra VGA monitor, I thought I'd pass on a little info. The culprit is a transistor that apparently controls the gain on the red signal. In a typical assembly-line soldering job, there is always the possibility of a cold solder joint in which the solder either cracks or simply never bonds to the part being soldered. Such is the case with this transistor.

If you're up to some soldering-gun work, remove the back of the monitor and unsolder the metal panel covering the circuit board that's attached to the neck of the CRT. Because the corners of this panel are soldered down and it tends to act as a heatsink, getting it loose takes some time.

Once you have the board removed from the CRT, look at the component side for a large black transistor mounted to an aluminum heatsink, above and to the left of the CRT socket. That's our miscreant. With a low-wattage soldering iron, touch up the connections to its leads. Then make sure its heatsink isn't touching any of the surrounding components.

Voilà! You're red gun is now firing away like a railgun.

—*Jim Peterson*

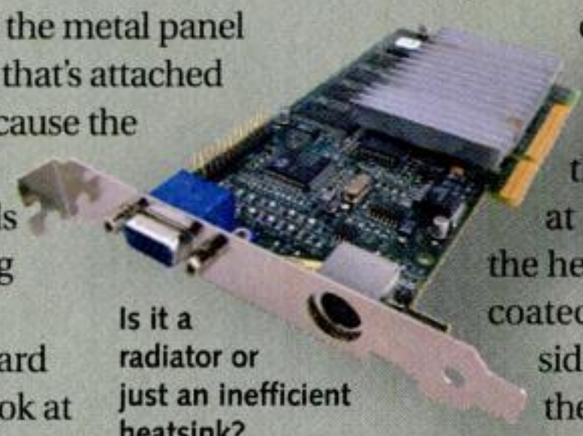
WARNING: It is dangerous to work on a monitor without proper training! We do not recommend doing so. Refer to page 71 for details.

Too Damn Hot

Anyone out there with the new Voodoo³ who's crying for more speed and really doesn't care about warranties, listen up.

The problem with overclocking the Voodoo³ is the heat. At the 3000's default clock speed of 166MHz, it's almost too hot to touch. And 3dfx only used thermal tape between the chip and heatsink!

First, remove the heatsink by pressing in the two clips that go through the card and carefully pulling. Clean off the thermal tape and all the glue (I used lighter fluid). Then, evenly apply heatsink compound or thermal grease with a silicon base that doesn't dry, harden or melt with thermal conductivity, and has a high enough rating for 200°C. Reattach the heatsink one clip at a time. Use a fan on the heatsink; I prefer to wrap coated wires around both sides of the heatsink and tie them off, ensuring the fan pushes air *from* the card. Plug in the fan and re-install the card. Download the Voodoo³ overclock utility, and the 3000 should now run a lot cooler. My 3000's running at 187MHz and, after some benchmarks, I'll try for 190 or more!



Is it a radiator or just an inefficient heatsink?

—*Aaron Asher*

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Getting Tubular

How Your Monitor Works

Seems like a new CPU or videocard technology rolls out every two months. And sure, losing yourself in the sheer plentitude of a million new silicon circuits might be just the right kink to satisfy your high-tech fetish, but sometimes don't you yearn for a simpler life?

We give you the humble computer monitor. Its basic design hasn't changed since the days of punch cards and skinny ties. You can't build a monitor with your 100-in-1 Home Electronics Kit, but the core technology stuffed inside one is much more the speed of Emmett's Fix-It Shop than Xerox PARC.

All traditional computer and television monitors are based on the same Cathode Ray Tube (CRT) technology that was first jimmied together by Germany's Ferdinand Braun in 1897. The short story is that an electron beam emanating from the back of the tube is coaxed to the front of the tube by a high-voltage, positively charged electrode; the beam excites a phosphorescent material on the inside of the tube's front face, creating a brief pulse of light.

The longer story requires a tour through the tube itself. We'll start in the back and work forward.

—Jon Phillips

Beam Me Up

The process begins by heating up a cathode, which by definition is a cell that emits electrons (which by definition are negatively charged). An electric current is applied to the cathode, taking it to about 800° Celsius, at which point the cell begins to shed its particles. These loose electrons are gathered by an electron gun, which focuses them into a narrow beam. Color monitors contain three guns, one each for the red, green, and blue (RGB) channels that mix together to form the full rainbow spectrum.

The electron guns sit at the very back of the vacuum-sealed CRT and fire their focused beams through anodes, which accelerate the particles. From here, the beams shoot through a deflection yoke located further up the tube's neck. The yoke is defined by four electromagnets placed around the neck in 90° intervals. By applying different voltages to each magnet, the yoke can push and pull the beams to any place on the phosphor-coated screen.

In actual practice, the beams follow a very specific path across the screen. They start at the top left-hand corner of the screen and sweep from left to right (at a speed of about 50,000mph), lighting each pixel on the uppermost row of pixels. The beams then return to the right, and sweep across the next row of pixels. The process continues—from left to right, top-most row to bottom-most row—until the beams hit the pixel on the extreme bottom right-hand corner of the screen.

Each row of pixels is called a raster. If your display is set to 1280x1024, you have 1024 raster lines, with each line containing 1,280 pixels. Once the beams have made a full sweep of the entire screen—a single refresh, if you will—they return to the left-hand corner of the upper-most raster and start anew. If your refresh rate is set to 85Hz, this process reoccurs 85 times each second. It's important to quickly redraw the screen in this manner because each pixel only lights up for a fraction of a second before dimming. By rapidly redrawing the screen, the CRT creates the illusion of a persistent image. Refresh rates below 75Hz can result in an annoying flicker effect, but some incredibly perceptive humans can pick up flicker below 85Hz. Or at least that's what they claim.

Three in the Chamber
The illustration depicts Sony's Enhanced Elliptical Correction system. Those harnesses around each beam are focus grids that refine the beam to maintain shape and intensity. The photograph shows an actual electron gun assembly; a single cathode supplies electrons to three individual guns.

Push-Me, Pull-Me
The deflection yoke is the monitor's most complex part. Before shipping, movable thumbwheels are adjusted at the factory for precise convergence. High-end monitors will also allow user adjustments via solid-state circuitry.

Los Tres Amigos

We should note that for most monitors, each individual pixel is actually defined by a triangular trio of phosphor dots—one for the red beam, one for the green, and one for the blue. By varying the relative intensity of each of the three electron beams as they sweep from pixel to pixel, the CRT can stimulate the corresponding RGB dots differently for precise color mixing.

For example, if pixel X needs to be defined as pure blue, the electron beam assigned to hit blue dots will be powered to full intensity, while the beams assigned to the red and green dots will scale

Your personal tech briefing on the concepts and components that make up the PC experience.

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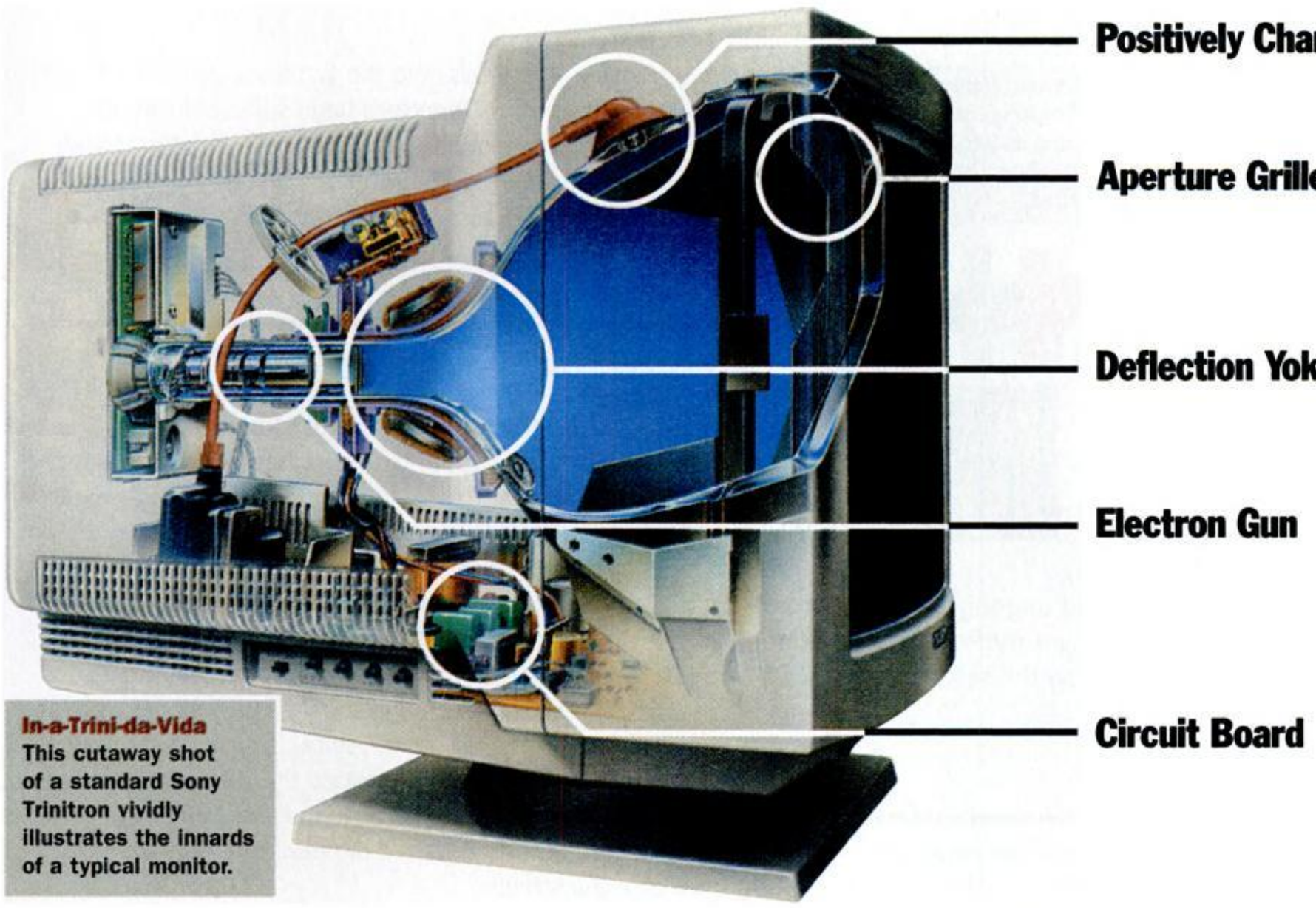

In-a-Trini-da-Vida
This cutaway shot of a standard Sony Trinitron vividly illustrates the innards of a typical monitor.

WARNING!
It is extremely dangerous to open up your monitor case and fiddle with parts. The inside of the case contains sharp, exposed sheet metal; a vacuum tube that can burst apart in a violent implosion; and capacitors that continue to hold an extreme electrical charge even after you shut the power off.

all the way down. If the immediately adjacent pixel Y needs to be defined as a purple tone, the red beam will power up and the blue beam will power down to achieve the right shade.

Before the electron beams hit their corresponding phosphor dots, they're filtered through some type of sieve that confines the electrons to each respective dot trio. This prevents loose electrons from spilling over into adjacent pixels and causing a blurry image.

Most monitors use a shadow-mask to perform this function. The mask is essentially a perforated shield that sits directly in front of the phosphor layer, with each perforation corresponding to an individual pixel. Sony Trinitron and Mitsubishi Diamondtron monitors, however, use an RGB phosphor scheme based on uninterrupted, vertical stripes. Phosphor stripe trios are separated from each other by narrow alloy strips; the entire grid of strips is called an aperture grille.

Kicked in the Grille
Who knows what heinous fate met this 15-inch Sony aperture grille. Aperture-grille technology, invented by Sony in 1967, fosters a brighter screen and better color uniformity. Still, some people are annoyed by the two barely perceptible horizontal damper wires (not shown in this photo) that keep the vertical grille wires in place.

Because the RGB phosphor stripes have no horizontal interruptions (like in a shadow mask), the sharp edges of the electron beams themselves must define the tops and bottoms of pixels. Whether this introduces fuzziness is debatable, but it does allow more electrons to hit the phosphor layer, which results in a brighter screen.

All About Pitch

The distance between phosphor elements defines a monitor's dot or stripe pitch. This spec—expressed as a fraction of a millimeter—is bandied about by monitor companies to celebrate a CRT's relative sharpness. All things being equal, the closer the phosphors are to each other (that is, the finer the pitch), the sharper your image will be.

When buying a CRT monitor, you have to consider how pitches are actually measured before you get all hot'n'bothered over whose pitch is finer than whose. The standard way to define dot pitch on a shadow-mask monitor is by measuring the distance between the centers of two neighboring phosphor dots of the same color. Because shadow-mask phosphor trios are triangular, this center-to-center measurement is diagonal; the actual *horizontal* distance between the neighboring same-color dots is 0.866 times the dot pitch.

This measurement discrepancy is germane when comparing dot pitches to stripe pitches. The same-color phosphor stripes of aperture-grille monitors are also measured center-to-center, but because the stripes are aligned in rows (and not grouped in triangles), their pitch measurements are naturally horizontal (see illustrations on page 72).

The diagonal arrangement of dot trios has no ill-effect on picture sharpness, so it's really only fair to use a common horizontal measurement when comparing advertised dot and grille pitches. To this end, when making dot-to-grille pitch comparisons, you should multiply the dot pitch by 0.866 to give the shadow-mask monitor its fair due.

With all that said, is there really much of a difference between, say, pitches of 0.25mm and 0.26mm? We think you'd be hard-pressed to detect a difference during regular gaming, web surfing, or even image editing. Indeed, arguing about a 0.01mm variance is foolish when other factors (such as resolution and convergence, discussed later) affect overall sharpness.

Most modern dot and stripe pitches fall somewhere between 0.25mm and 0.28mm (at least on the relatively good monitors reviewed by *Maximum PC*). Last year, in its F500 model, Sony introduced a 0.22mm stripe pitch that does indeed greatly improve image clarity when you inspect fine detail up close.

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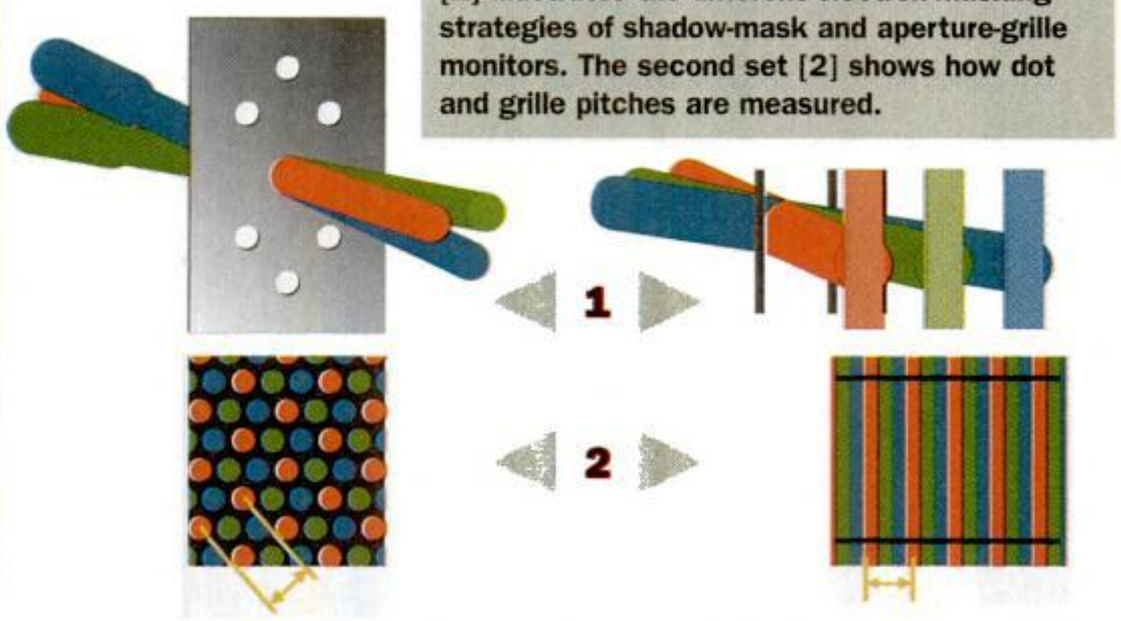


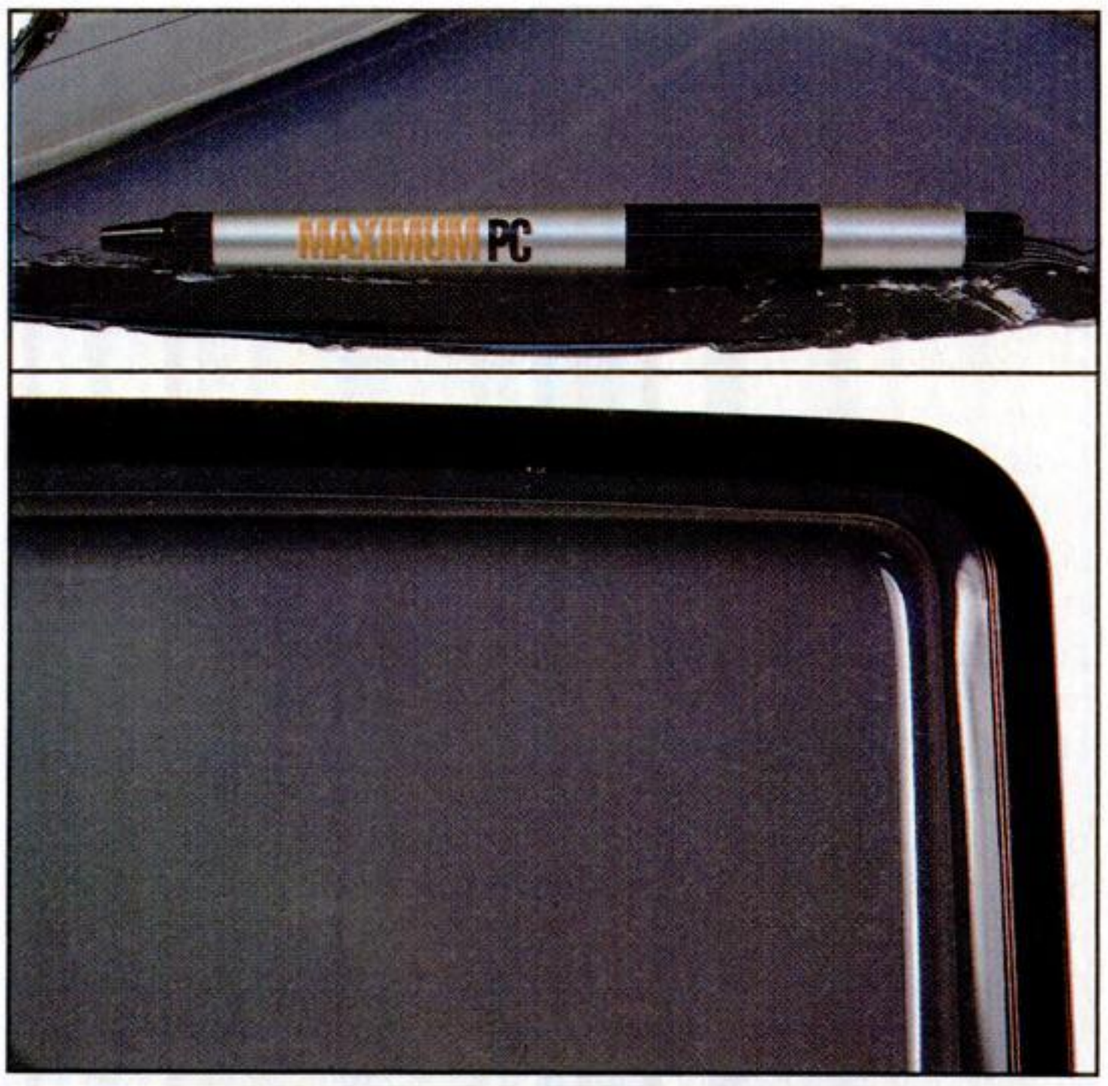
Of Dot and Stripes The first set of drawings [1] illustrates the different electron-masking strategies of shadow-mask and aperture-grille monitors. The second set [2] shows how dot and grille pitches are measured.

On the opposite end of the spectrum, you'll find ungodly coarse pitches in standard television sets—but you'll never notice the pitch grain unless you're sitting extremely close to the set.

Resolution and Refresh

A monitor's phosphor trios—be they dots or stripes—are arranged on a fixed grid. Most 19- and 21-inch monitors boast 1,600 trios across each horizontal raster, with 1,200 trios going down each vertical column. Thus, these monitors are limited to resolve a maximum of 1,920,000 separate pixels (the product of 1,600 and 1,200). Any monitor can scale to smaller resolutions. For example, an object that's six pixels wide at 1600x1200 will be resolved as 12 pixels wide at 800x600. But no monitor can effectively present a resolution that exceeds its logical grid arrangement.

Resolution and refresh rate are intimately related: the higher the resolution, the slower the refresh rate. Remember that a screen refresh is a physical process; the electron guns are sweeping across each pixel many times per second. So when you set your monitor to jump from, say, 1024x768 to 1280x1084, you're asking your hardware to resolve more pixels, and the sweeping process is taxed accordingly. A monitor must therefore have sufficient internal bandwidth to present acceptable, flicker-free refresh rates at high resolutions. Today, top-of-the-line monitors will do 85Hz and higher at 1600x1200, and a crazy 160Hz at 640x480.



It's Thickerer Betcha didn't think your monitor glass was this pudgy, did you? At about 0.25-inches thick, this Sony glass meets implosion resistance standards.

What Can Go Wrong

It's a wonder that monitors can present such pristine images given everything that can go wrong with them. Our two least favorite glitches are misconvergence and geometric distortion.

- **Misconvergence:** Color monitors must have their three rapidly moving RGB guns home in on a single miniscule pixel at exactly the same time. This doesn't always work out as planned. When the RGB beams misconverge, colors don't perfectly superimpose for proper color mixing. In worst-case scenarios, this results in color fringing on the edges of objects.
- **Geometric distortion:** This can be manifest in any number of ways. For example, perfect circles and squares may appear as ovals and oblong rectangles. Like misconvergence, this particular type of geometric distortion is always worse toward the corners of the screen due to increased beam deflection angles. It all has to do with the beams traveling different distances at different intensities toward different parts of the screen.

When your beams hit the screen's center-most pixel, they're nailing it straight-on. Let's say this is a 15-inch journey from gun to phosphor. But when the beams have to hit, say, a pixel in the top-right, they're striking a glancing blow at maybe 18 inches. It's much harder to achieve perfect geometry (and convergence) at this angle. You can test this at home with a flashlight: Stand in front of a wall and shine the beam directly in front of you—the beam describes a circle. Now keep the flashlight on its original axis and hit the corner of the wall—the beam describes an oval. Get the point?

Obviously, your onboard circuitry makes adjustments for the more dramatic deflection angles, but it's an imperfect process, and distortion is inevitable.

To better hit the extreme edges of big monitors, your gun should be relatively far away from the phosphor layer—this shortens overall deflection angles and mitigates the need for an inordinate amount of distortion compensation. For this very reason, the new "short-neck" monitors are especially prone to geometric distortion. Same goes for the new "flat-screen" monitors: It helps to have a curved screen when your goal is deflection uniformity across the entire screen.

The Final Word

There are probably more monitor companies in existence than any other type of computer component manufacturer. But not all of them make their CRTs. The fact is, a lot of far-eastern manufacturers sell their own CRTs to smaller companies that brand them under their own names. Sometimes the wannabes actually commission CRTs to their own specs, but oftentimes these companies simply slap some plastic over the original manufacturer's base product and call it a day.

If you want to determine who made your monitor's CRT, jot down the FCC "grantee" code on the back of the monitor and enter it into the FCC database at **www.fcc.gov/oet/fccid/**. You won't find "FerdyCo" anywhere in the database, but you can't say Herr Braun didn't have his chance.

Thanks go to Sony and Samsung for providing parts and information for this article. Gun and monitor illustrations by Sony.

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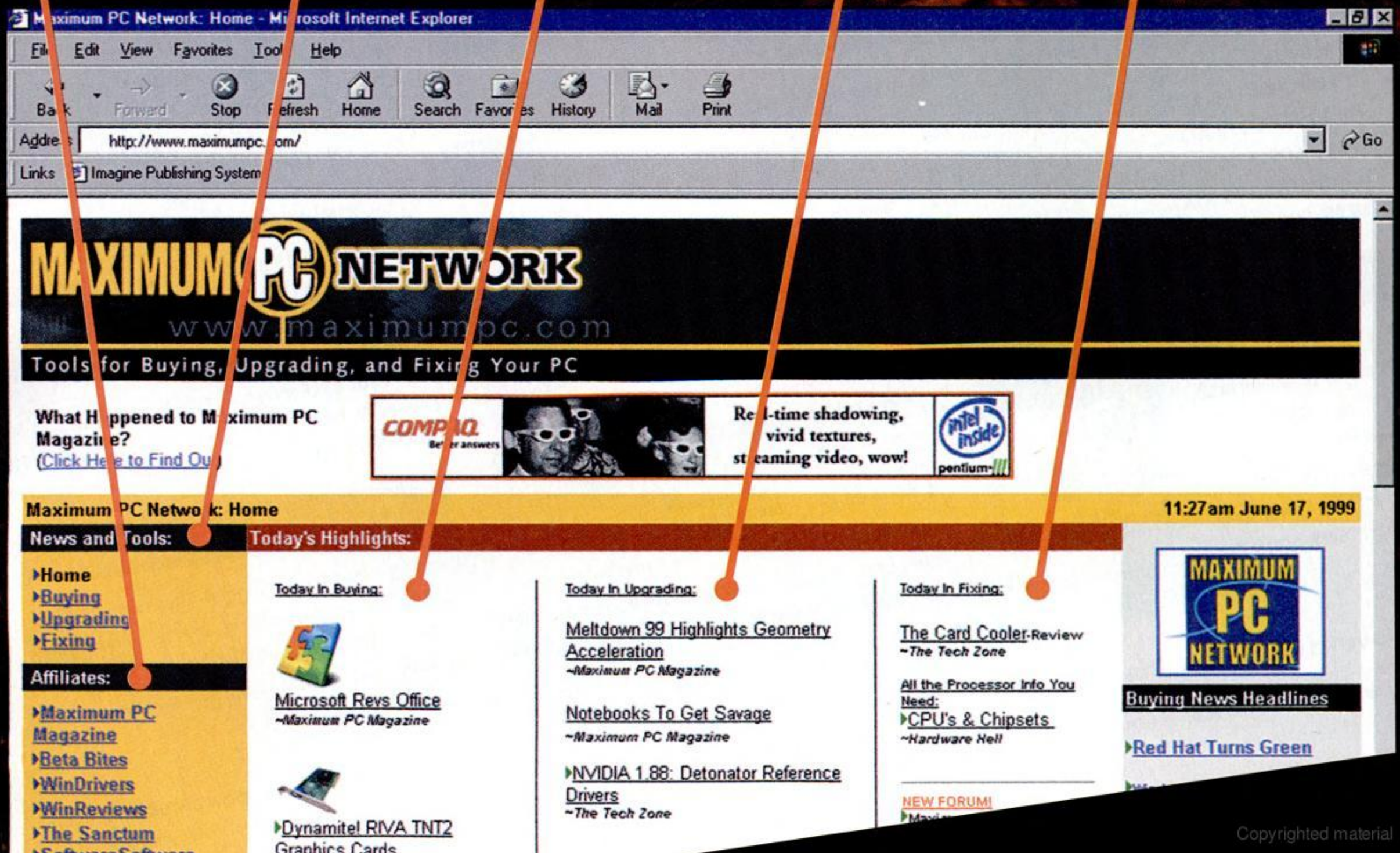

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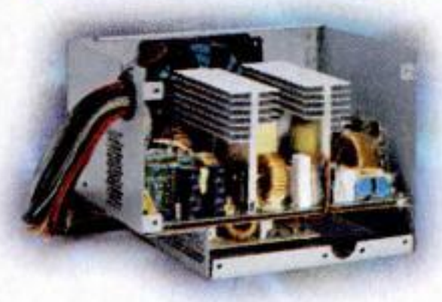

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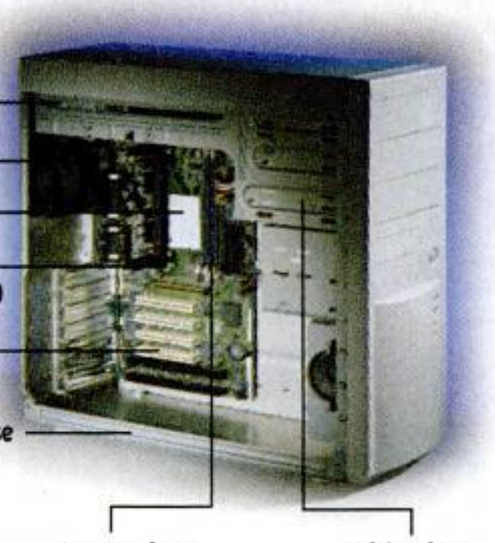
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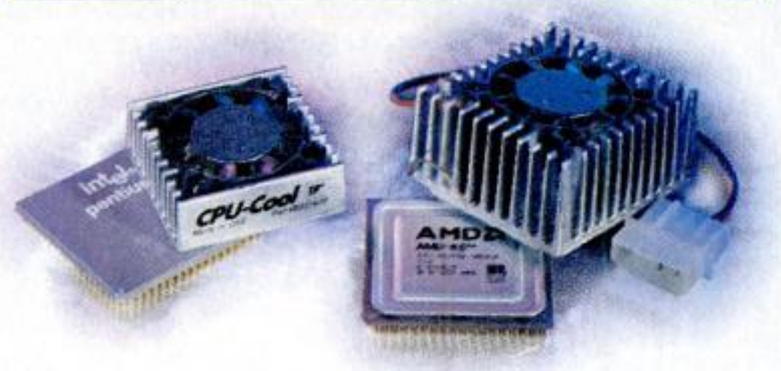

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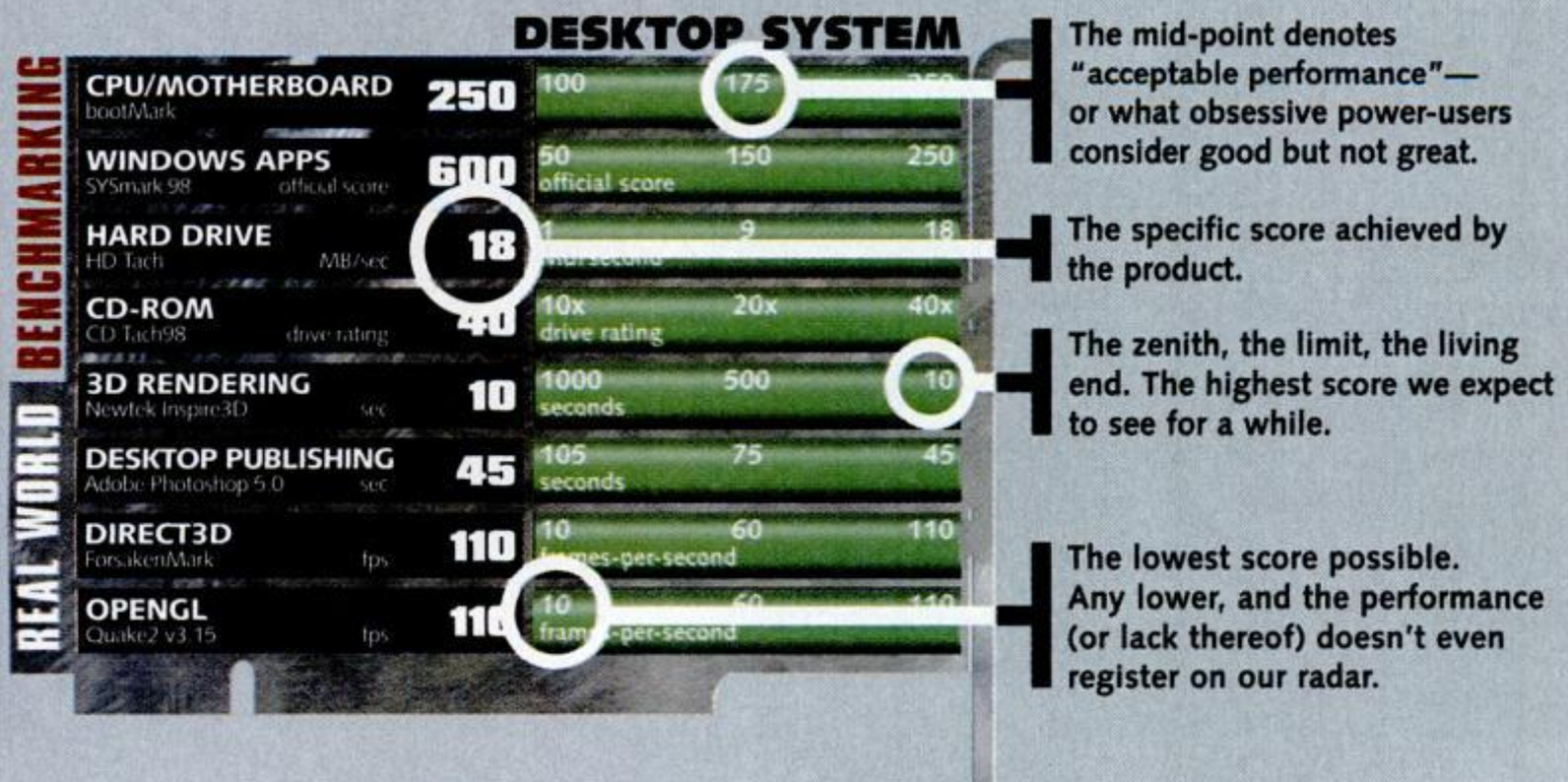
Testing Policy

Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the Maximum PC lab by Maximum PC editors, and, whenever possible, we use real-world applications to gauge performance. Our final verdicts are based on benchmark results and a subjective appraisal of product features.

EDITOR'S CHOICE AWARD:
Only 9 and 10 verdicts are even eligible for the coveted Kick Ass award, the mark of PC excellence.

Online Guide to Benchmarking

Go to **www.maximumpcmag.com/benchmarking** for the complete explanation of *Maximum PC*'s benchmarking policies.



KICKIN' THE TIRES ON THE LATEST HARDWARE AND TAKIN' THE LATEST SOFTWARE OUT FOR A SPIN

Hardware Photography by
AARON LAUER

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HP Pavilion 8500

Intel inside, iMac outside

The Pavilion has a lot going for it, including the price. But beware the clutter inside.

PLUSES
- 550MHz Pentium III
- Funky-ass aesthetics
- Explosive TNT2 card
- MX300 soundcard
- DVD and CD-RW

MINUSES
- Restrictive case design
- No Zip drive
- No TV-out
- Only one free PCI slot (and it's shared)

The Pavilion 8500 incorporates exciting technologies such as Intel's latest Pentium III processor, nVidia's latest graphic chipset, Aureal's latest sound chipset, and a DVD/CD-RW combo that'll satisfy your removable-storage cravings. But these technologies take a backseat to something that's not even remotely high-tech: plastic.

Check out the front of the Pavilion 8500 and you can't help but notice the funky-ass, iMac-inspired, "what the hell were they thinking" plastic shell adorning the front and top of the case. Half the *Maximum PC* team thought the design was inspired; the other half thought it was insipid. Among our debate: the usefulness, or lack thereof, of the plastic door that bars entry to the CD-RW drive and additional drive bay; and the butterfly-shaped CD storage bin on the top of the case—which some thought was the perfect place to store up to four brewskies.

But as we said, the Pavilion 8500 is chock-full of technology goodness, fortified with some very cool features. For speed, nothing beats Intel's 550MHz Pentium III, and overall, the system benchmark numbers were within a hair of other similarly equipped machines, including Dell's XPS T550 reviewed last month. For graphics, you can harness the explosive power of nVidia's TNT2 Ultra, courtesy of Diamond's kick-ass Viper V770 card. But if you opt for HP's $449 17-inch monitor, your games are limited to 100fps, given the monitor's maximum refresh rate (85Hz) at 1024x768 resolution.

For storage, you have plenty of options: Hitachi's 6x DVD-ROM drive (which spun regular CDs at 16.8x); HP's purple-accented CD-Writer Plus 8100 (which scored a 9/Kick-Ass in our February issue); and Maxtor's 15.7GB, 7,200rpm EIDE hard drive, which posted a staggering average transfer rate of 17.85MB/sec, the highest rate we've ever seen in a desktop machine. Phew! And if you're a cool cat with level-5 wiring in the home, the bundled NIC will satisfy your networking needs.

As good as this all sounds, there are some caveats. For starters, there's no Zip drive. Yeah, we know—the CD-Writer Plus takes up most of this slack. But for people-to-people transfers, nothing beats a Zip. (A Zip drive is available as an option through HP's build-to-order paradigm.) The three-piece Polk Audio speaker setup is certainly good enough. CD music and game sound effects sound robust, but the satellite-to-woofer cut off at around 100Hz, while the bass dwindled down around 40Hz. Still, thanks to the inclusion of the two-output-equipped, A3D 2.0-compliant MX300 PCI soundcard, you also have the option of executing a real quad-speaker setup.

Our biggest complaint is reserved for the mini-tower case. Although the side panel comes off with relative ease via a three-step "unscrew and pull" process, the cornucopia of cables, cards, and cords are packed in so tight you'll need a machete to cut a swath to the DIMMs and free ISA and PCI slots.

Finally, the Pavilion 8500 also includes a couple of ports on the front bevel. One is for USB (another port is located on the back); the other is labeled the "digital camera port." Don't be fooled: that's just a fancy-schmancy name for a serial port.

—Bryan Del Rizzo

UNDER THE HOOD

THE BRAINS	
CPU	Intel Pentium III 550MHz
L2 Cache	512K internal
RAM	128MB PC100-compliant SDRAM (expandable to 256MB)
Motherboard	Asus Condor1, BX chipset
Drive Bays	Three 5.25-inch, one 3.5-inch
I/O Ports	Two serial, one parallel, two USB, Ethernet
DISPLAY	
Video	Diamond Viper 770 with nVidia TNT2 Ultra, 32MB SDRAM, AGP 2x
Monitor	Optional HP Pavilion 17-inch M70
Res/Refresh	1280x1024/60Hz
STORAGE	
Hard Drive	Maxtor 15.2GB 7,200rpm, Ultra DMA IDE
DVD	Hitachi 6x GD-2500 DVD-ROM
Removable	Floppy
Fax/Modem	56K LT Win Modem
SOUND	
Sound	Diamond PCI MX300 with Aureal Vortex 2 chipset and A3D 2.0
Speakers	Polk Audio AMR System 2 with two 18-watt satellites and one 32-watt subwoofer
OTHERS	
HP CD-Writer+ 8100	

BOOT 1:11 DOWN 0:05

REAL WORLD BENCHMARKING

CPU/MOTHERBOARD bootMark		256
WINDOWS APPS SYSmark 98	official score	218
HARD DRIVE HD Tach	MB/sec	17.9
CD-ROM CD Tach98	drive rating	17x
3D RENDERING Newtek Inspire3D	sec	404
DESKTOP PUBLISHING Adobe Photoshop 5.0	sec	58
DIRECT3D ForsakenMark	fps	99.5
OPENGL Quake2 v3.15	fps	88.8

MAXIMUM PC VERDICT

Price $2,064; $2,513 (with monitor and speakers)
Company Hewlett-Packard
Phone 800.724.6631
URL www.hp.com

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EXPANSION NOTES

You have one free ISA and one free PCI slot, and there's room to add more memory, but beware: It's a jungle in there.

EXPANSION MAP

AGP 2D/3D videocard
PCI Soundcard
PCI Modem
PCI NIC
PCI/ISA Free
ISA Free

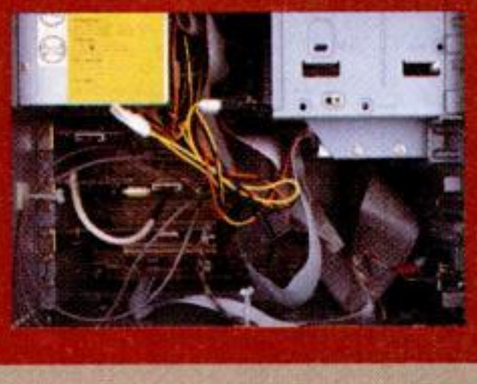
IROS

00 System timer	**08** System clock
01 Keyboard	**09** ACPI bus
02 IRQ controller	**10** USB
03 COM2	**11** Sound/videocard
04 COM1	**12** Mouse
1 Modem/NIC	**13** Num data proc
2 Floppy port	**14** IDE controller
07 Printer port	**15** IDE controller

DMAS

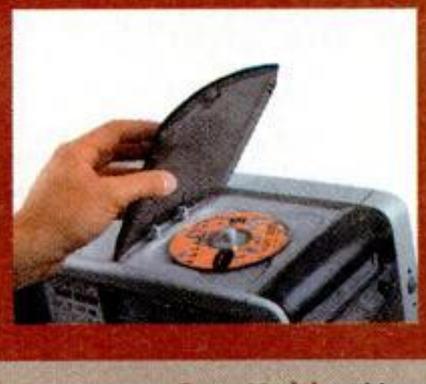
00 Free	**03** Soundcard
01 Soundcard	**1** DMA controller
02 Floppy	

Expanding Your Repertoire Here's a screen shot from our new *Expendable* benchmark. The Pavilion scored on average 56.7fps, slightly higher than other TNT2 cards because of the latest nVidia drivers.



Snakes? I Hate Snakes! Behold the snake pit inside the case. Can you say cluttered? We thought you could.

I'd Like to Buy a Vowel, Pat The bundled 8500 keyboard is a beaut' and includes separate controls for volume, DVD, Internet hot-buttons, and shortcut keys.



Beverage Cup Holder No, that's not a CD-ROM drive. It's actually a CD disc holder located on top of the case.

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Red Hat Linux 6.0

The best install of a Kick Ass operating system

Linux is a kick-ass operating system. Every *Maximum PC* reader worth his or her salt should have a hard drive partition or two dedicated to this fine OS. But spending $80 to get the hook-up from Red Hat is not the only way to get there.

By design, Linux is an OS built by and for hardcore programmers. That means it isn't necessarily the greatest for everyday users—and that's where Red Hat (and other vendors) come in. Red Hat has collected the vast mass of drivers, tools, and applications that make up Linux and packaged them into an easy-to-use, easy-to-install, cohesive whole.

THE SPECS

WHAT YOU NEED

- CD-ROM drive
- Supported graphic card
- 386 or higher
- 16MB RAM (32 rec)
- 500MB hard disk space

PLUSES

- Best Linux install to date
- Tons of apps, drivers, and tools included
- Extremely configurable GUI
- Open source
- fast and stable

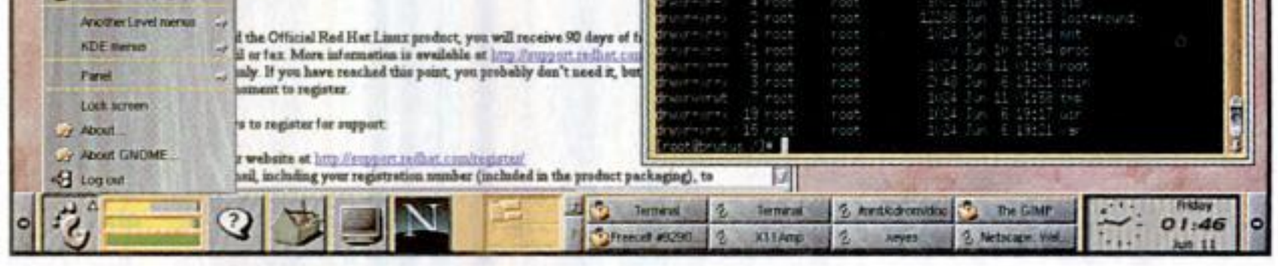
MINUSES

- Weak telphone support
- GUI barely runs on 16MB systems
- Sparse graphics/ sound setup documentation

Red Hat's core is the Red Hat Package Manager (RPM), an excellent tool that worries about dependencies, painlessly performs installations and removals, and lets you search the net for new versions of software. Red Hat also features the Windows-like GNOME desktop environment, multiprocessor support, drivers for common PC hardware, and a whole raft of applications.

Installing Red Hat is simple, assuming that all your hardware is supported (check before you install!) and that you have a free partition or spare hard drive to install onto. If not, you may be forced to wipe your hard drive unless you have a robust repartitioning tool such as *Partition Magic*. For the price Red Hat is charging, such a tool should come in the bundle. Once you've created the partitions, it's easy to set up dual-booting to allow simple switching between Windows and Linux.

The boxed copy of Red Hat comes with an Enhanced Application CD with more than 50 commercial applications, though many are limited trial versions and most can be found free on the net, if you have the time to scour the net. Version 6.0 also comes with 30 days of telephone and 90 days of e-mail support, but only for installation issues. We tested Red Hat's telephone support with an obstinate network card but were disappointed. Clearly, the phone technician knew less than what's available in the free support area on Red Hat's own web site.



The Red Hat Package Manager gives you total control over what is installed on your system.

Red Hat Linux 6.0 includes the GNOME graphical user interface, an integrated desktop environment that combines ease of use with flexibility and reliability.

On a fast system with lots of memory, Linux excels and just plain feels faster than Windows. Switching between tasks is quick and painless. But like Windows, Linux takes its time booting and shutting down. On the other hand, you won't find yourself doing this often because you can make complex system configuration changes without shutting the system down.

Red Hat is a great distribution of Linux, but many will gripe that the company hasn't thrown in enough extras to justify the high price. After all, you could download the entire distribution from Red Hat's FTP site.

But for the rest of us who are not interested in pulling three CD-ROMs of data down from the Internet, and those who want to support the best install of this great OS to date, Red Hat 6.0 is a no-brainer.

—Chris Dunphy

MAXIMUM PC VERDICT

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Price $80
Company Red Hat Software
Phone 888.733.4281
URL www.redhat.com

DISTRIBUTION DILUTION

There's just one Windows 98, one BeOS, and one OS/2 (remember that?). But there are nearly as many distributions of Linux as there are Linux hackers. Each distribution taking a snapshot of the ever-evolving Linux source tree in an easy-to-install package.

The other major distributions worth checking out include Red Hat, Caldera OpenLinux (**www.calderasystems.com**), Debian GNU Linux (**www.debian.org**), and SuSE Linux (**www.suse.com**). And others offer unofficial versions.

For info on Linux distributions, kernel updates and patches, news, and software, the following web sites are indispensable: **www.freshmeat.net**; **www.linux.org**; **www.linuxtoday.com**. and **linuxtoday.com**.

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Everybody needs games. Even this guy. We're talkin' cards. Board games. Hey, even chat with opponents while you play. Actually, that might be a bad idea.

www.yahoo.com

You can't see your opponent. Sometimes that's a good thing.

Yahoo! Games

Do You Yahoo!?

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TNT2 Rockets Take Off

New boards are Ultra fast

Strap a rocket to your back and you might be able to fly, but you certainly won't do it gracefully. In the same vein, strapping a TNT2 Ultra to a PCB may yield top-flight performance, but it's up to the card maker to make the damn thing aerodynamic. If implemented correctly, a TNT2 Ultra videocard is a wonder to behold. If done poorly, it's a nightmare to get working. Since nVidia left many of the messy little details, such as clock settings and driver implementation, up to the card makers, TNT2 Ultra boards are landing all over the performance map.

In this roundup, Creative Labs, Hercules, and Guillemot are hoping to hit the right trajectory to propel their boards into your AGP slot. Each card features different core and memory clock speeds, and different versions of nVidia's reference drivers. Unfortunately, no card in this roundup incorporates nVidia's latest 1.88 drivers, which include 3DNow! and SSE optimizations. You can expect a big boost in performance when they finally do.

—Sean Downey

Hercules Dynamite

PLUSES
- Fastest 3D card we've seen
- Cool Hercumeter overclocking utility
- Incredibly fast 3D performance
- Highly tweakable drivers
- Did we mention the card was fast?

MINUSES
- Poor DVD Playback
- Hercules Entertainment Center doesn't really serve a purpose

Creative Labs 3D Blaster

PLUSES
- Strong performance when compared to higher-clocked cards
- Best drivers of the bunch
- Overclocking utility (beta)
- Unified drivers (beta)

MINUSES
- Poor DVD playback
- Weak TV-out

Guillemot Maxi Gamer

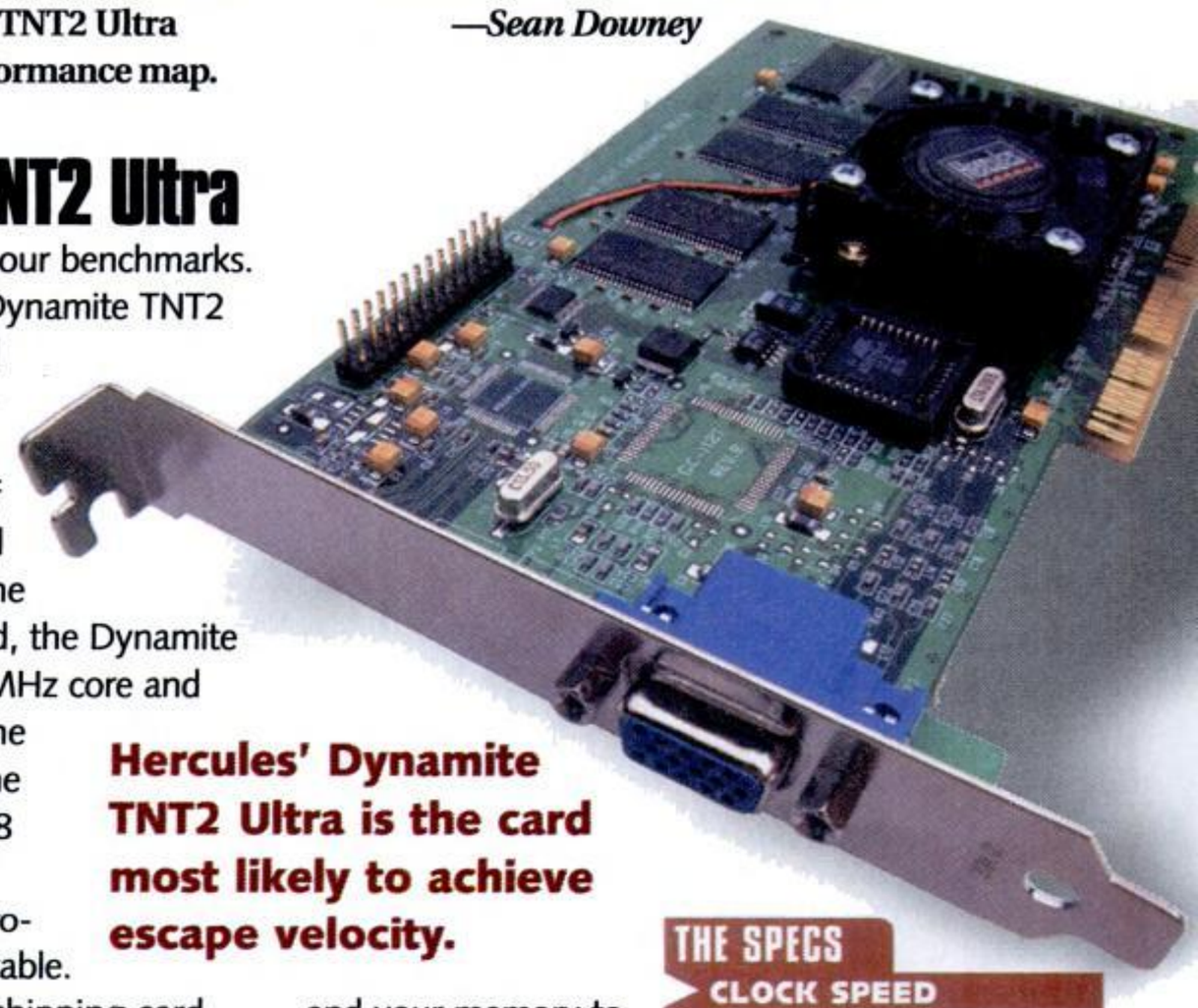
PLUSES
- Inexpensive
- Pretty good software bundle

MINUSES
- Poor DVD playback
- Uninspired drivers
- No overclocking slider
- Weak TV-out

Hercules Dynamite TNT2 Ultra

MAXIMUM PC KICK-ASS! product

This is the card that killed our benchmarks. We originally received a Dynamite TNT2 Ultra for our July 3D card feature, and quickly realized that our old benchmarks were incapable of measuring the card's full potential. Weighing in with the fastest clock speeds in the 3D world, the Dynamite is a texel-tossing terror with a 175MHz core and 32MB of 200MHz SDRAM. It hit the triple-digit promised land in both the *ForsakenMark* running at 1024x768 and the *Quake II* timedemo at 800x600. Unfortunately, the pre-production card we had then wasn't stable.



Hercules' Dynamite TNT2 Ultra is the card most likely to achieve escape velocity.

As the benchmarks show, the shipping card is rock-solid. The only place the Dynamite loses ground to the 3D Blaster is in the *Half-Life* timedemo, which benefits immensely from Creative's updated drivers. Hercules is hard at work on new 1.88 drivers that should take the Dynamite into the stratosphere.

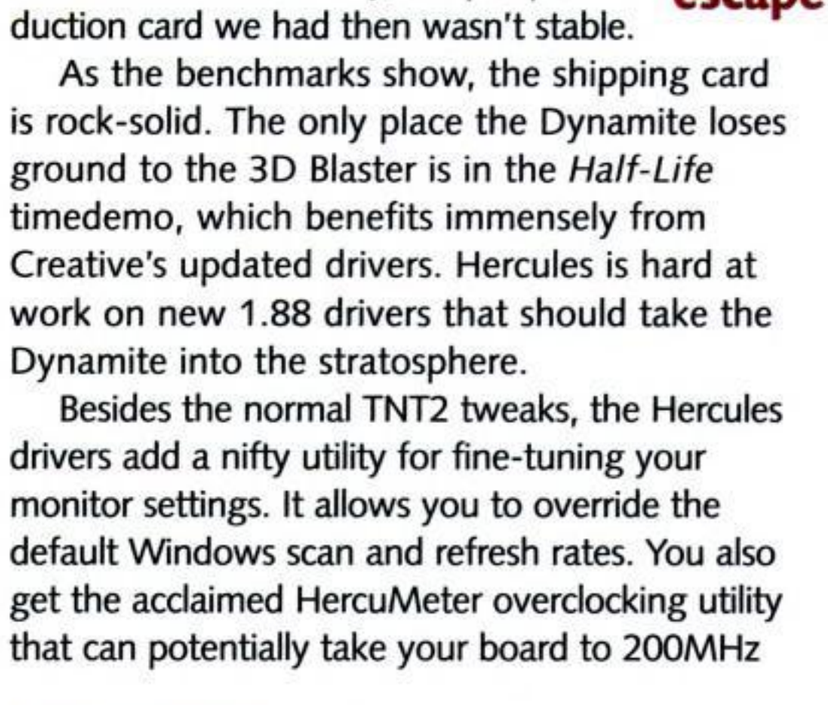
Besides the normal TNT2 tweaks, the Hercules drivers add a nifty utility for fine-tuning your monitor settings. It allows you to override the default Windows scan and refresh rates. You also get the acclaimed HercuMeter overclocking utility that can potentially take your board to 200MHz and your memory to 235MHz. Results will vary according to your system configuration, but potential payoff in fill rates is staggering.

The Dynamite TNT2 Ultra's one weak spot is its lame multimedia manager software. While the *Entertainment Center* is supposed to handle DVD playback, we couldn't get it to work, and tweaking the *Entertainment Center*'s options repeatedly caused it to crash. Word to the wise, Hercules—you might consider licensing software that you don't know how to make yourself.

THE SPECS

CLOCK SPEED	175MHz bus 200MHz memory
RAMDAC	300MHz
AGP SUPPORT	Full 2x/4x
LOCAL MEMORY	32MB SDRAM
MAX 32-BIT RES	1920x1200
MAX 16-BIT RES	1920x1200
MAX 1600X1200 REFRESH RATE	93MHz
BUNDLE	Win9x/NT drivers I Hercules Entertainment Center

REAL WORLD BENCHMARKING



TEST SYSTEM: 500MHz Pentium III, 440BX AGPset, 128MB SDRAM, running Win98 with version 1.76 of the Hercules drivers. K6 benchmarks are posted online. As always, V-sync is enabled. *Indicates test done in 32-bit color.

MAXIMUM PC VERDICT

Price $245
Company Hercules
Phone 800.532.0600
URL www.hercules.com

9

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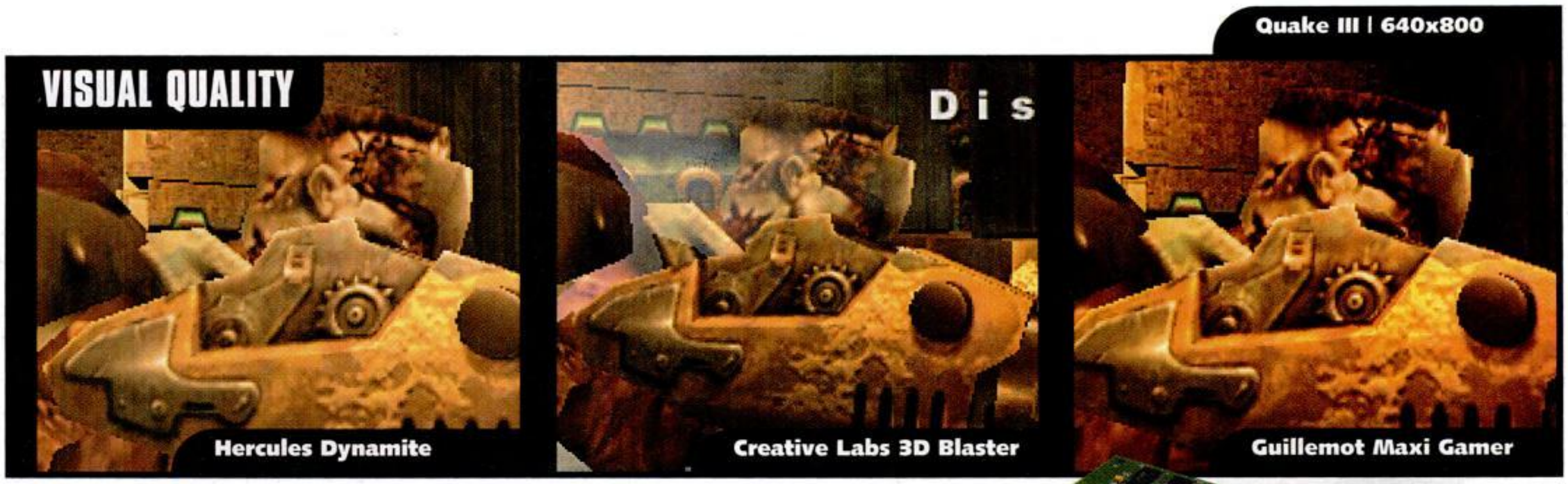
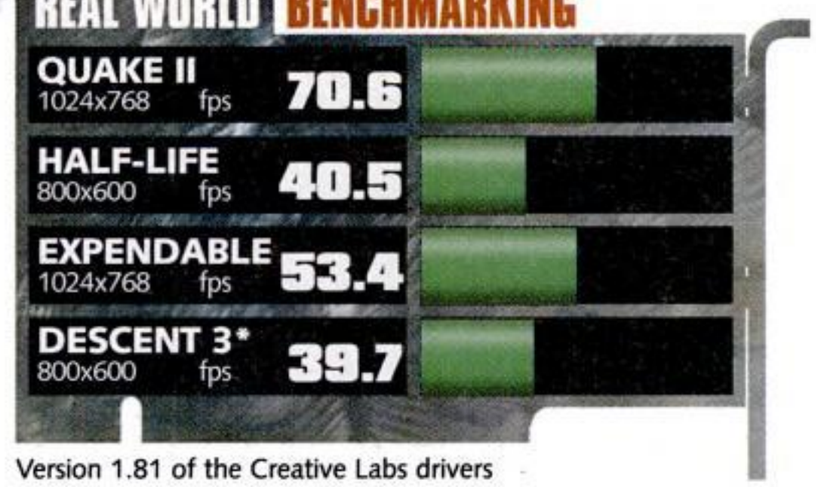


Creative Labs 3D Blaster TNT2 Ultra

Clocked at 150MHz and stocked with 32MB of 183MHz SDRAM, the 3D Blaster sticks close to nVidia's reference specs. Creative gains the upper hand by providing timely driver updates and innovations such as the Unified drivers, which let TNT cards run Glide games. Though still in beta, they work pretty well for older Glide games.

Creative's new Blaster Control centralizes all important TNT2 tweaks and provides extensive monitor fine-tuning and TV-out controls. But with the card's poor TV-out, Creative might as well be putting makeup on a pig—image quality is a blurry mess. While the shipping drivers limit overclocking to memory only, Creative's new beta overclocking utility can take the card to 183MHz and the memory to 220MHz. Creative's new utility lets you test your settings and reset your clock from safe mode. Damn good idea if you ask us.

Creative's innovative new drivers make up for the lower clock speeds of the 3D Blaster.


REAL WORLD BENCHMARKING
QUAKE II 1024x768 fps 70.6
HALF-LIFE 800x600 fps 40.5
EXPENDABLE 1024x768 fps 53.4
DESCENT 3* 800x600 fps 39.7

Version 1.81 of the Creative Labs drivers

THE SPECS

CLOCK SPEED
150MHz bus
183MHz memory
RAMDAC
250MHz
AGP SUPPORT
Full 2x/4x
LOCAL MEMORY
32MB SDRAM
MAX 32-BIT RES
1920x1200
MAX 16-BIT RES
1920x1200
MAX 1600X1200 REFRESH RATE
85MHz
BUNDLE
Win9x/NT drivers | Sonnetech Colorific and 3Deep

MAXIMUM PC VERDICT

Price $230
Company Creative Labs
Phone 800.998.5227
URL www.creative.com

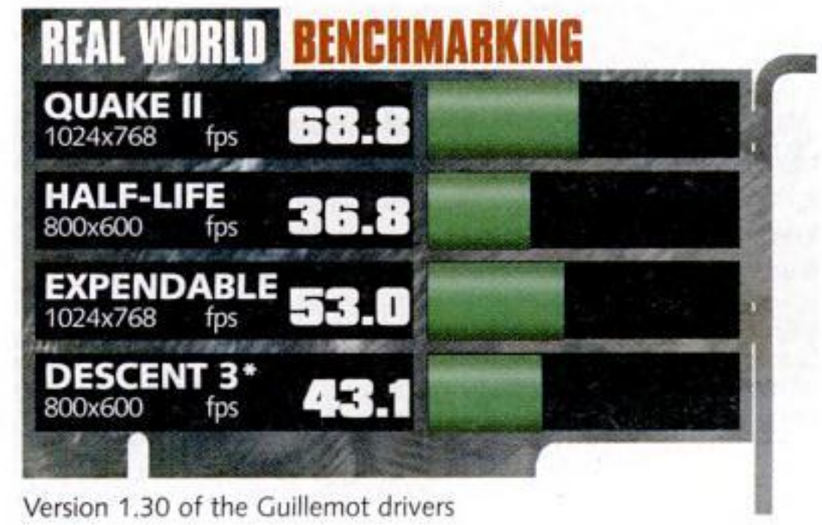
8

Guillemot Maxi Gamer Xentor32

Guillemot had the audacity to send us an overclocked Xentor32. What were they thinking? Officially, the board should run at 175MHz and have 32MB of 183MHz SDRAM. After playing with the card, we realized the memory was overclocked to 195MHz. Guillemot says that some of the Xentor32s shipping actually have faster memory than is indicated on the box. Since we can't confirm whether anyone who buys this card will be blessed with faster memory, we underclocked the Xentor32's memory for all benchmarks to its official 183MHz setting.

Even at the slower setting, the Xentor32 is a strong performer, but it just doesn't stand up to the speed of the Dynamite TNT2 Ultra or the updated drivers of the 3D Blaster TNT2 Ultra. Guillemot's drivers don't offer anything you can't find in the nVidia reference drivers, except TV-out, which has the same blurry image quality as the 3D Blaster. And the drivers for the Xentor32 don't include an overclocking slider. Guillemot needs to bring more to the table besides overclocked memory to compete against the Diamonds and Creatives of the world.

The Xentor32 doesn't have much to recommend besides the TNT2 Ultra chipset itself.


REAL WORLD BENCHMARKING
QUAKE II 1024x768 fps 68.8
HALF-LIFE 800x600 fps 36.8
EXPENDABLE 1024x768 fps 53.0
DESCENT 3* 800x600 fps 43.1

Version 1.30 of the Guillemot drivers

MAXIMUM PC VERDICT

Price $200
Company Guillemot
Phone 877.484.5536
URL www.guillemot.com

7

THE SPECS

CLOCK SPEED
175MHz bus
183MHz memory
RAMDAC
300MHz
AGP SUPPORT
Full 2x/4x
LOCAL MEMORY
32MB SDRAM
MAX 32-BIT RES
1920x1200
(web site says 2048x1536)
MAX 16-BIT RES
1920x1080
MAX 1600X1200 REFRESH RATE
85MHz
BUNDLE
Win9x/NT drivers | Speed Busters: American Highways demo | Kingpin: Life of Crime demo | XingDV

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13.0 GB UltraDMA Hard Drive[1]	17.0 GB UltraDMA Hard Drive[1]	17.0 GB UltraDMA Hard Drive[1]
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intel inside pentium® III

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17.0 GB UltraDMA Hard Drive[1]	17.0 GB UltraDMA Hard Drive[1]	22.0 GB UltraDMA Hard Drive[1]
6X DVD-ROM Drive[5]	6X DVD-ROM Drive[5]	6X DVD-ROM Drive[5]
Savage4 Pro 16 MB 2X AGP Graphics Card	Savage4 Pro 16 MB 2X AGP Graphics Card	32 MB Creative 3D Blaster TNT2 ULTRA Graphics Accelerator
Diamond Monster Sound MX300 PCI Audio Card	Diamond Monster Sound MX300 PCI Audio Card	Diamond Monster Sound MX300 PCI Audio Card
56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]	6.0Mb Max Digital Modem[6]
JBL Pro Premium Speakers w/Subwoofer	Klipsch v.2-400 Speakers	JBL Pro Premium Speakers w/Subwoofer
Digital Creativity Imaging Center[3]	Digital Creativity Imaging Center[3]	Digital Creativity Imaging Center[3]
100 MB Iomega Zip Built-In Drive with 2 disks	Home Phoneline Networking PCI Card[7]	Microsoft Office 2000 Small Business
Microsoft Office 2000 Small Business	Microsoft Featured Home Collection + MS Word	Microsoft Windows98
Microsoft Windows98	Microsoft Windows98	Compaq CV915 19" Monitor (18.0" VIA)
Compaq CV715 17" Monitor (16.0" VIA)	Compaq CV715 17" Monitor (16.0" VIA)	
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Hughes DirecPC Satellite: Add $349	32 MB Creative 3D Blaster TNT2 ULTRA Graphics Accelerator: Add $109	Tripp Lite Internet Office 500 UPS: Add $149.95

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Compaq Home

Natural Born Virus Killers

Top-notch infection detection

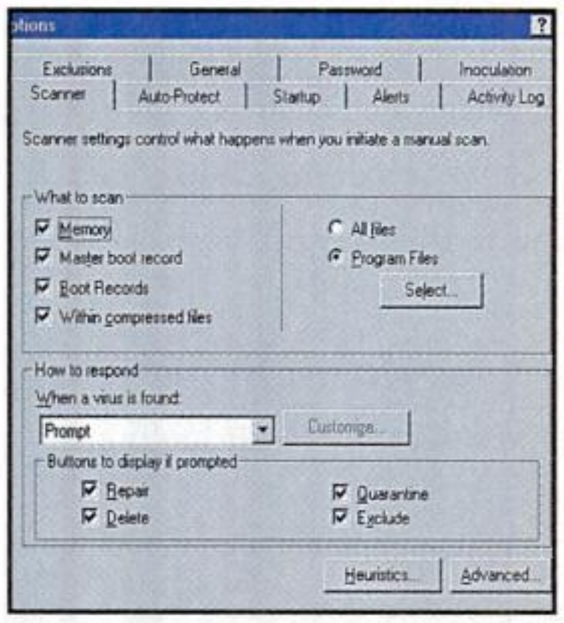
There's nothing we hate more than those who conspire to bring harm to our PCs. When a virus attacks, the results can be simply annoying or completely devastating. If you're constantly downloading and installing gizmos, we urge you to pick up an anti-virus utility to watch your back.

We scoured the Internet and rounded up 60 of the nastiest, most stubborn viruses and threw them at three of the best-known anti-virus software packages. The resulting cage fight proved one thing: If you think all anti-virus software is the same, you've got another thing coming.

—Josh Norem

Norton AntiVirus 5.0

Virus makers hate Peter Norton and his white shirt/black tie ensemble. *Norton AntiVirus* is tough stuff and comes loaded with features that would frustrate any would-be virus spreader. *NAV* uses "Striker" technology to weed out polymorphic viruses, and a heuristic virus scanner called "Bloodhound." In our testing, *NAV* found 53 out of 60 viruses on our infected system, with scans averaging 3 minutes, 45 seconds. When the same viruses were placed into a single Zip file, *NAV* tracked down only 45. E-mail protection was exemplary—*NAV* refused to let us either attach viruses to e-mail or open them once they arrived. Though Norton's interface and usability are top-notch, its virus detection is on par with the competition in some areas and below in others, making it a good buy, but not the cream of the crop. When the next version of *NAV*, 6.0, arrives in August, we'll take a close look and report back.



A bevy of options await the Norton user.

MAXIMUM PC VERDICT

Price $60
Company Symantec
Phone 800.441.7234
URL www.norton.com

7

VirusScan 4.03

McAfee *VirusScan* is a feature-rich package that performs impressively. Its Hunter scanning engine was the fastest and most accurate in our test. Scans averaged a zippy 1 minute, 39 seconds, and sniffed out 53 of 60 viruses—the same number *Norton* discovered. When it scanned our Zip file, *VirusScan* found the same number it did on the desktop—53.

Configuring a scan is a snap with McAfee.

VirusScan's e-mail performance was a letdown. Although it prohibited us from sending some viruses as attachments, it unanimously allowed us to save them to our hard drive, and even let us open the Melissa virus. Considering how highly McAfee touts *VirusScan*'s e-mail capabilities, the fact that it missed one of the biggest troublemakers of the past few months is a serious lapse that we hope is addressed in future updates. E-mail concerns aside, *VirusScan* is a solid solution and garners our vote for the best anti-virus software currently available.

MAXIMUM PC VERDICT

Price $50
Company Network Associates
Phone 408.988.3832
URL www.mcafee.com

8

Antivirus Platinum

The wild card in our test, Panda's *Antivirus Platinum* scored amazingly low despite the fact that it holds more certifications than any other developer in the world from the International Computer Security Association. To Panda's credit, it offers many features its competitors do not, such as daily updates, year-round 24/7 technical support, and a lifetime of free updates.

Panda uses a Windows-like interface for easy navigation.

In initial scans, Panda's Exterminator scanner found 50 viruses, with scans averaging 3 minutes, 4 seconds. Its e-mail detection was top-notch, as it repeatedly stopped us from attaching or opening viruses via e-mail and sending them. But several files did slip through, including an *Excel* macro virus. Panda displayed the poorest performance during its scan of our Zip file full of viruses—it didn't find a single infected file. It sees the files when they're extracted, but as soon as they're zipped they disappear. While Panda offers a truckload of goodies its competitors lack, its virus detection is simply not up to snuff.

MAXIMUM PC VERDICT

Price $59
Company Panda Software
Phone 415.392.5950
URL www.pandasoftware.com

7

DARE TO COMPARE

	SYMANTEC NORTON ANTIVIRUS 5.0	MCAFEE VIRUSSCAN 4.03	PANDA ANTIVIRUS PLATINUM
Scan time for hard drive (min:sec)	3:45	1:39	3:04
Number of viruses found on hard drive	53	53	50
Number of viruses found in Zipped file	45	53	0

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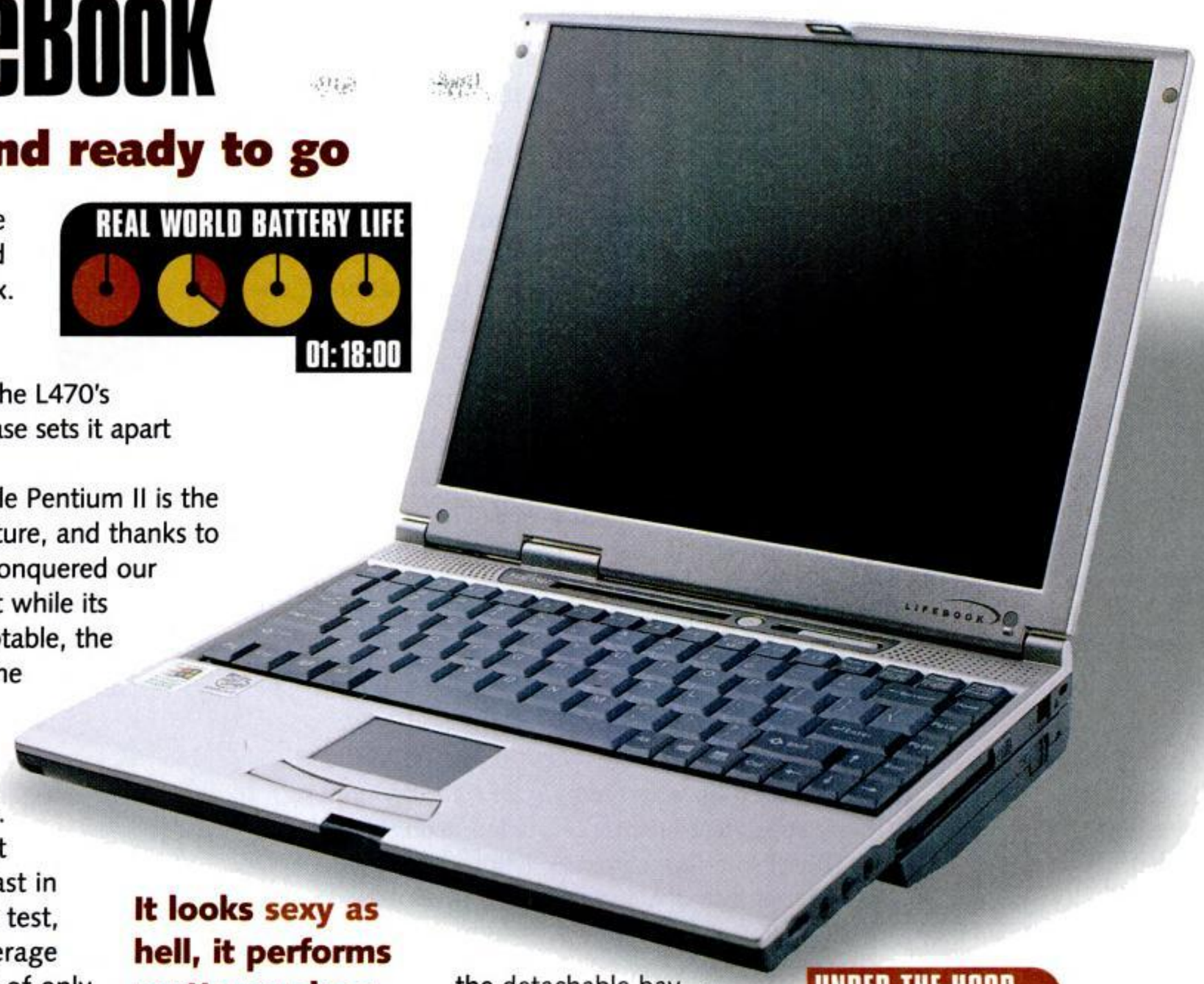
Fujitsu LifeBook

All dressed up and ready to go



REAL WORLD BATTERY LIFE

01:18:00

Like a distinguished gentleman, the LifeBook L470 comes nattily attired in the high-tech equivalent of a tux. Some would debate the merits of such serious vanity, but in a notebook world that's primarily black, the L470's gray and silver-magnesium-alloy case sets it apart from the crowd.

Looks aside, the 366MHz mobile Pentium II is the LifeBook's most distinguishing feature, and thanks to its processing prowess, the L470 conquered our benchmarks most impressively. But while its performance was more than acceptable, the L470 didn't break any records in the process. We've reviewed eight similarly-equipped notebooks recently, and the L470 ranked within a hair's breadth of the pack. Distressingly, it ranked dead last in our hard drive test, posting an average transfer speed of only 12.4MB/sec. Ouch.

PLUSES
- 366MHz Pentium II
- External volume control
- Two-tone design
- Modularity

MINUSES
- Single USB port
- No TV out
- Not Direct3D-compliant

It looks sexy as hell, it performs pretty much as expected, and you won't break your back carrying it around.

Though Fujitsu hobbled the L470 by excluding a Direct3D-compliant chipset—an absence that guarantees its eventual obsolescence—its saving grace is its wonderfully thin (one inch with the case closed), lightweight (3 lbs+) design. This engineering marvel comes courtesy of the brightly lit 13.3-inch screen (the smaller the screen, the smaller the weight) and a detachable wedge (similar to Compaq's design, sans the additional ports), which sports expansion bays that'll hold a CD/DVD-ROM drive, a Zip drive, *and* an extra battery. Even better, when the wedge is attached, the entire notebook is elevated, providing a very comfortable, angled platform to type on. However, the detachable bay—which includes the CD-ROM—doesn't come standard. To get one, you'll have to plunk down an additional $101 (the extra buck presumably just to bring the overall price to a nice round number). Also available, but not tested, are an optional $749 DVD-ROM drive with a PC card-based MPEG-2 decoder card, an additional battery ($249), and a LAN dock ($499). For those who care, an external floppy drive is included with the raw notebook. A V.90 modem is built in, too.

Although we would've preferred dual USB and PS/2 ports, the L470 does include a couple of other features that are a rarity these days: external controls to adjust the monitor brightness and system volume.

If it's thin you want, you'd be wise to scope out the L470. It doesn't play games very well, but its light weight makes it well equipped for most of your other mobile needs.

—Bryan Del Rizzo

DARE TO COMPARE

COMPANY	PRICE
Compaq Presario 1670	$1,999
Acer TravelMate 332T	$2,699
Sony Vaio 190	$3,100
Fujitsu LifeBook	$3,100

UNDER THE HOOD

THE BRAINS	
CPU	366MHz Intel mobile Pentium II
RAM	64MB SDRAM (expandable to 192MB)
I/O Ports	Single PC card, parallel, serial, external monitor, single USB, single PS/2, IrDA, microphone-in, headphone-out, line-out
Modem	Built-in 56K V.90 modem
DISPLAY	
Videochip	NeoMagic MagicGraph 128XD with 2MB EDO
Display	13.3-inch active-matrix display
Res/Depth	1024x786/16-bit
STORAGE	
Hard Drive	Toshiba 4.3GB Ultra DMA
CD-ROM	Matsushita 20x
SOUND	
Sound	ESS 1897 software wavetable/FM synthesis
Speakers	Stereo speakers
TIPPING THE SCALES	
Lap Weight	3 lbs, 9 oz without wedge, 5 lbs, 9 oz with wedge
Carry Weight	6 lbs, 6 oz

BOOT 1:02 DOWN 0:04

REAL WORLD BENCHMARKING

CPU/MOTHERBOARD bootMark	163.4
WINDOWS APPS SYSmark 98 official score	146
HARD DRIVE HD Tach MB/sec	7.0
CD-ROM CD Tach98 drive rating	12.4x
3D RENDERING Newtek Inspire3D sec	570
DESKTOP PUBLISHING Adobe Photoshop 5.0 sec	138
DIRECT3D ForsakenMark fps	WNR
SPREADSHEETS Microsoft Excel 97 sec	189

MAXIMUM PC VERDICT

Price $3,100 with expansion wedge
Company Fujitsu PC
Phone 888.466.8434
URL www.fujitsu-pc.com

8

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CE in Color

Two PDAs get the once-over

In today's fast-paced world, Personal Data Assistants have become a necessity for more than just business—for many people, these Pop Tart–sized appendages hold together their entire lives. We decided to test the latest second-generation color CE hand-helds from Philips and Compaq to see if they have what it takes to keep a *Maximum PC* editor's life in order.

—Kenn Durrence

Philips Nino 510

Most CE palm devices are mired in mediocrity by a poorly implemented OS, but the Philips Nino 510 stands above the others—thanks in part to version 2.2 of the Windows CE software. V2.2 offers numerous improvements, most notably addressing the out-of-memory problems that cropped up when too many apps were open.

THE SPECS

PROCESSOR
32-Bit MIPS 75MHz RISC

RAM
16MB

I/O
IrDA port, docking port

DIMENSIONS
5.25x3.41x.75 inches

OTHER
Recording and voice recognition, CF-2 card slot

PLUSES
- bTask saves time
- Great software bundle
- Sweet screen
- Rechargeable battery

MINUSES
- Mono audio
- No USB
- Novelty voice command

The CE interface mimics the familiar look of Windows 95/98 quite well, so the device has a low entry point. CE also comes armed with Powertoys, enabling great contact, calendar, and e-mail management, and allowing better integration between PIM applications. CE can even initiate the dialing of numbers from the contact list, through DTMF output. However, *Internet Explorer* and *Outlook* are required in order to use all the functions of the OS.

The Nino is chock-full of useful software. With the inclusion of *bTASK*, Phillips eliminates the six-step procedure for closing down tasks using the Task Manager. *NinoImage* enables you to view both BMP and JPEG images. *bPrint* and *bFAX* allow printing and faxing directly from your Nino. *AvantGo* provides current headlines with downloaded news from the *Wall Street Journal*, *USA Today*, and CNNfn. *CalliGrapher* and *Jot* allow handwriting recognition, and T9 text input reduces the amount of keystrokes needed to enter information.

The best CE device we've seen to date.

With its 75MHz MIPS-based RISC processor, 16MB of ROM, 16MB DRAM, and ergonomic button placement, the Nino 510 is a real pleasure to manipulate. In spite of all this, Nino isn't perfect. The 320x240, 256-color active-matrix screen was eye pleasing indoors, but unusable in direct sunlight. And though we loved Nino's ability to play WAV files and MP3s, we were disappointed by the mono output jack that hinders playback. It would also be a no-brainer for Philips to ship the Nino with a USB connector, since it claims that the memory expansion slot can handle a USB connection. But even with the obvious room for improvements, the Philips Nino 510 is the best Windows CE device we've used.

MAXIMUM PC VERDICT

Price $449
Company Philips Electronics
Phone 888.367.8356
URL www.nino.philips.com

8

Compaq Aero 2150

Compaq's Aero comes with a 256-color screen that put the Nino to shame when used in direct sunlight. But aside from that small feat, there's not a lot about this little guy that impresses us.

THE SPECS

PROCESSOR
MIPS 70MHz RISC

RAM
16MB

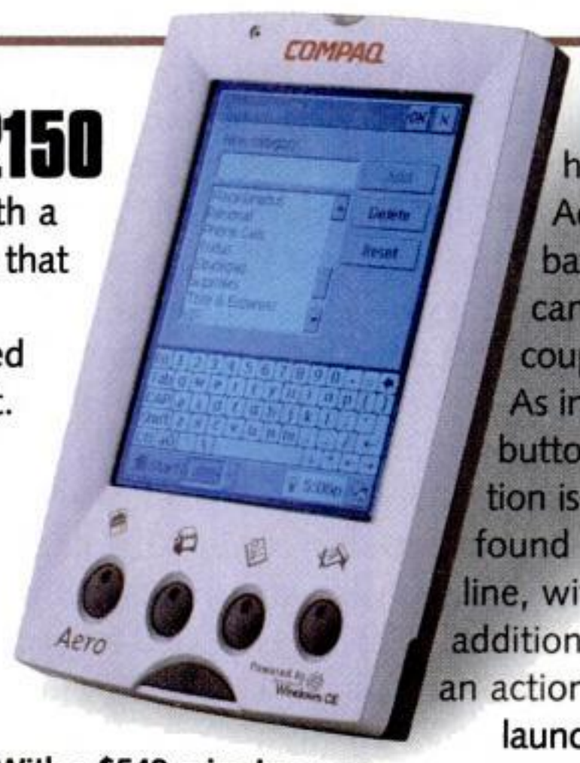
I/O
IrDA port, docking port

DIMENSIONS
5.27x3.34x.78 inches

OTHER
Recording, CF-2 card slot

PLUSES
- Nice outdoor visuals
- Carrying case

MINUSES
- Lacks good software package
- Heavy



With a $549 price tag, you should look elsewhere for a PDA.

Aero uses a 70MHz MIPS-based CPU for all system functions, and comes with 16MB of memory installed (upgradable to 24MB); you can add more with CF-2. Though the unit ships with a back-up battery (for a total of 10 hours of constant use), having to use Aero's proprietary battery means you can't rely on a couple of double-As in a pinch. Aero's button implementation is similar to that found on the Palm line, with notable additions including an action button for launching applications in a single click, a thumb nub for easy one-handed navigation, and a Voice Recorder button for capturing dictation on the fly. We were pleased that Aero plays back MP3s, but disappointed that, like the Nino, it comes with a mono phone jack.

Overall, Aero is less polished than the Philips Nino, mainly due to its minimal bundled software and poorly implemented stylus storage (our stylus broke during testing and had to be forced out of its holder by tapping the box like a pack of cigarettes). Aero is also about $100 more expensive than the Nino. If you're looking for a Windows CE device, we suggest that you save some jack and go with the Philips Nino.

MAXIMUM PC VERDICT

Price $549
Company Compaq
Phone 281.370.0670
URL www.compaq.com

5

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Palm VII

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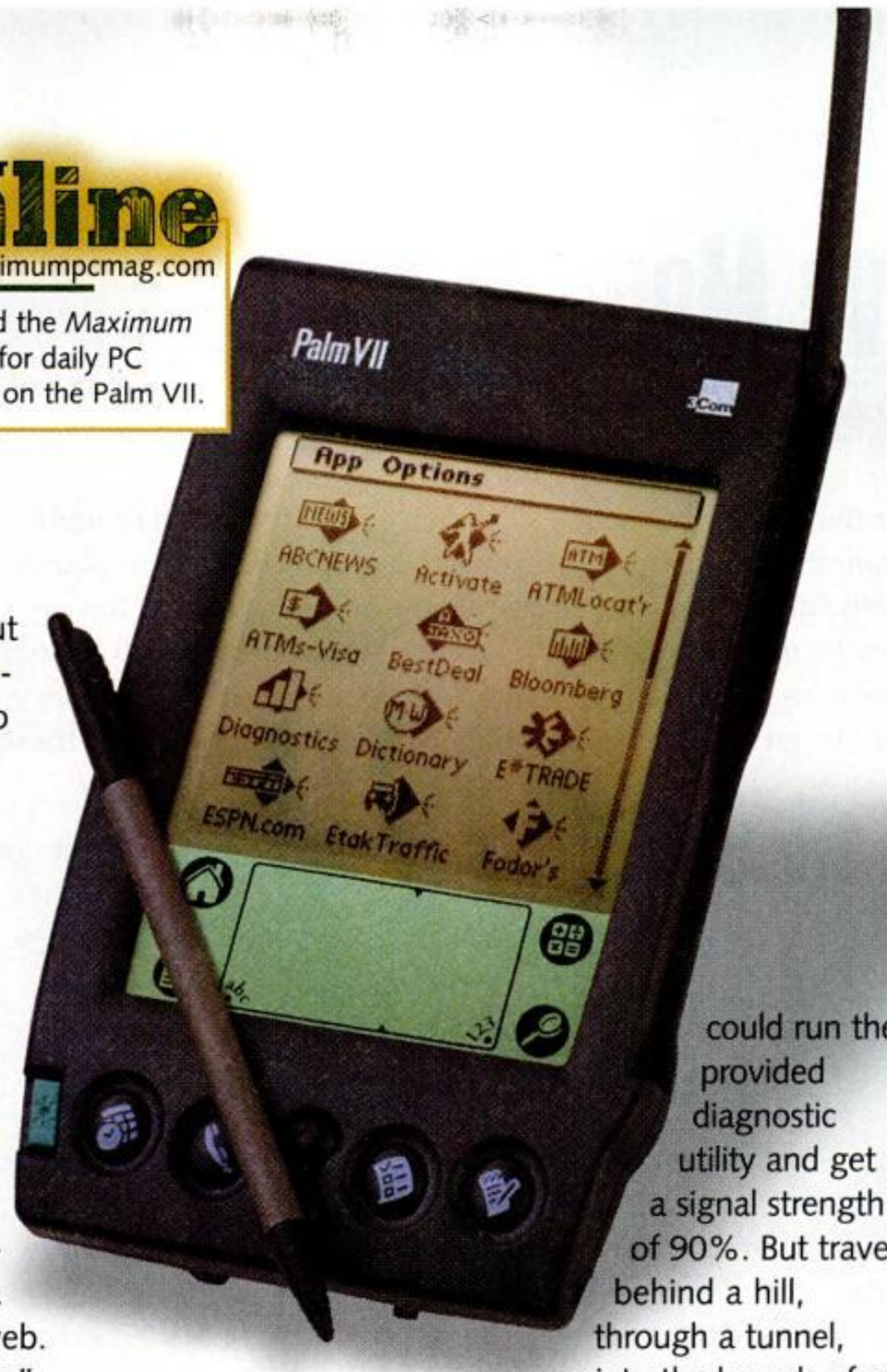
Download the *Maximum PC* client for daily PC headlines on the Palm VII.



The Palm VII is your walkie-talkie to the web.

You could think of the Palm VII as a PDA with a walkie-talkie tuned into the web, but at a deeper level, it represents 3Com's transition from the one-shot razor business into the repeat sales of razor blades.

At $599, the hardware costs a pretty penny, nearly double the price of the more burly IIIx. But 3Com is counting on the monthly wireless service the Palm VII requires for its real revenue stream.

For $25 a month, Palm VII owners can download 150K, roughly 750 screens of data, from Bell South's wireless network. A budget plan costs $10 a month, but at 30 cents for every additional K downloaded, you're better off with the beefier plan, especially considering the device's addictiveness.

The Palm VII doesn't *really* access the web. It uses a special service called "web clipping." Content providers must build a simple app that parses HTML data and web scripts to snatch info ranging from the nearest ATM machine, to show times at the local bijou, to current stock prices, out of thin air. At launch, 3Com had an impressive list of content partners, and with the superior developer support already available it should only get bigger and better.

But this dependence on content partners is also the Palm VII's biggest problem.

As far as the Palm VII's raison d'être goes, it's only as good as its partners' content, which upon launch was often bad. Vague headlines leading to abbreviated stories waste pricey download time. For example, recent world headlines from ABCNews.com were: "Progress Reported," "A Papal Slip-Up," "A Princely Affair," and "Picking Up The Pieces." Clever, but all worthless for helping the Palm VII surfer decide which stories to download. SlashDot grabs the first paragraph from its news stories, but frequently the necessary info is contained in subsequent paragraphs or links, which don't translate to the Palm VII. In general, sites offering concise (over colorful) headlines, short summaries that provide pertinent details, and full-blown stories as an option serve readers best. Some of the better services at launch include The Wall Street Journal Interactive Edition, MapQuest, and Bloomberg.

Long stories require longer download times, which can be problematic when reception is spotty. In open areas near a transmitter, you could run the provided diagnostic utility and get a signal strength of 90%. But travel behind a hill, through a tunnel, or into the bowels of a building, and reception plummets. Still, the service covers surprising ground out the gate. Early coverage around our San Francisco Bay Area offices was stable into Sacramento 90 miles to the east and San Jose 50 miles to the south.

BellSouth's Wireless Network gives Palm VII owners access to data across the country.

From a hardware perspective, the Palm VII represents the third coming of the Palm III. Other than the 5/8-inch taller case, flip-up radio antenna (which activates service), and the IIIx's bright screen, the Palm VII is identical to the Palm III, right down to the 2MB of memory. One thing oddly missing is the flip cover that protects the screen. The VII has the divots to hold one, but ships without a cover.

Still, with wireless access to virtually unlimited info, the limited storage is less of an issue (ditch that K-consuming dictionary file, Merriam-Webster has one online for you). And if you have the ducats to feed the addictive download habit, the Palm VII is a dream come true that fulfills the promise of wireless data.

—Brad Dosland

MAXIMUM PC VERDICT

Price $599 (plus $10 to $25/month service fee)
Company 3Com
Phone 800.881.7256
URL www.palm.net

9

THE SPECS

SCREEN RESOLUTION	160x160 grayscale
PROCESSOR	Motorola Dragonball 68328
O/S	Palm OS 3.2
I/O	IrDA port | docking port | 8,000bps wireless
REMOVABLE STORAGE	None
DIMENSIONS	3.25x5.25x0.75 inches; 7 oz
BUNDLE	Docking cradle

PLUSES

- Wireless data is great
- Wireless e-mail is better
- Standard Palm body
- Easy to develop for
- Massive coverage range at launch

MINUSES

- Service charges can add up
- Some weak content providers at launch
- No protective cover
- Only 2MB memory

SENDING WIRELESS E-MAIL

In addition to limited web access, the Palm VII has a limited form of e-mail that alone is nearly worth the price of admission. Without plugging into a phone jack, the Palm VII's *iMessenger* app can send and receive Internet messages through a palm.net account created when you sign up for the wireless service. This works just like traditional e-mail, but with a few limitations. All attachments are stripped from incoming messages, due to the bandwidth constraints of the wireless transmitter. And because *iMessenger* transmissions rack up upload/download charges just like web transmissions, it's best to keep your palm.net account strictly for mobile use, like an expensive cell phone account.

Massive Monitor Mania

Two flatties and a shorty

No monitor can offer a truly flawless display, but compared to the crap that's bundled with sub-$1,000 systems, the tubes on this page are technical triumphs—especially considering their design constraints. The Sony and Mitsubishi models offer completely flat screen planes, while the Samsung model has an extremely short neck—features that can lead to bad corner flaws (see page 70 for details). We tested these three monitors at 1600x1200/75Hz using *DisplayMate*'s Video Obstacle Course, a series of test patterns that evoke the worst problems your CRT will ever encounter.

—Jon Phillips

Samsung has engineered great geometry and screen purity despite the 900SL's extremely short neck.

Samsung SyncMaster 900SL

With a depth of just 15.5 inches, this 19-inch monitor consumes less desk space than most 17-inch models. The wee neck is almost comical in its nubbiness, but if you consider desk space a premium, you can't do better.

Viewable screen area is 17.9 inches. Max resolution is 1600x1200 (at 75Hz). Dot pitch is 0.25mm—pretty standard, but now glaringly coarse compared to Sony's grille-pitch victory described below. The 900SL is bright for a shadow-mask monitor, and exhibited just subtle color mottling (another common shadow-mask pitfall). Geometric accuracy was surprisingly good in the corners; no worse than the Mitsubishi model but definitely not as true as the Sony. Perfect circles appeared as ovals in the extreme bottom-right side. The display exhibited bad blue-red convergence. Overall convergence and anti-glare took third-place this roundup; performance in these areas wasn't bad, but nothing to get excited about. BNC connectors say the 900SL is workstation-ready, but the low price, unexciting control set, and short neck say, "Hello, Home Consumer!"

MAXIMUM PC VERDICT

Price $549
Company Samsung
Phone 800.933.4110
URL www.samsung.com

8

Sony GDM-F500

MAXIMUM PC KICK-ASS! product

The 21-inch F500 boasts a screen so flat, it must be seen to be appreciated. And once you do see it, you'll never again tolerate the cylindrical curvature of other aperture-grille CRTs, or the spherical bulbousness of shadow-mask CRTs. The monitor's revolutionary 0.22mm grille pitch, though, is what earns this display a perfect 10. Fine-detail sharpness was nonpareil, especially in text reproduction: 9-pixel/6.8-point type was easily legible on the F500, but a murky mess on the other two monitors here. Indeed, the monitor's sharpness sets a new visual benchmark.

Sure, it costs a bundle, but the F500 offers the best display and control set we've ever seen.

Corner geometry and color convergence were also excellent, especially given the engineering problems introduced by the flat screen. We saw only the most subtle ovaling of circles in the upper-right corner, and the slightest green-red misconvergence. The F500 does 85Hz at 1600x1200 and 80Hz at 1800x1440, its max resolution. The monitor comes with BNC inputs, a four-port USB hub, and a veritable Control-Set-o-Rama. You even get convergence and beam-landing controls! Our only knock on the 19.8-inch viewable tube is that relative brightness appeared a bit dim, but overall the F500 is absolutely breathtaking.

MAXIMUM PC VERDICT

Price $1,900
Company Sony
Phone 800.635.7669
URL www.ita.sel.sony.com

10

In the 19-inch category, the 900u humbles most competitors with its bright, flat screen.

Mitsubishi Diamond Pro 900u

The 900u lands squarely in the 19-inch category with a screen as flat as (if not flatter than) the Sony F500. Truly flat screens reduce glare from ambient light, and display images closer to how you see them in real life (thus negating the bulbous distortion illusions introduced by spherical screens). While the 900u presented a brighter display than the other monitors reviewed here, it didn't blow our minds with perfectly aligned color convergence or geometric accuracy in the corners. Perfect squares in both top corners appeared as vertically oblong rectangles.

With a grille pitch that hits 0.25mm in the center of the screen and graduates to 0.27mm on the edges, the 900u didn't quite meet the same level of sharpness of the Samsung—6.8-point type was just a tiny bit blurrier. The 18-inch viewable monitor hits its maximum 1600x1200 resolution at 75Hz. USB ports, BNC connectors, and onscreen controls for corner purity sweeten the deal, but the 900u's best feature is its bright, flat screen.

MAXIMUM PC VERDICT

Price $800
Company Mitsubishi
Phone 800.843.2515
URL www.mitsubishi.com

8

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DFI-P-2-BX Intel 440 BX, 100 MHz. bus, 3 SDram sockets, 1 AGP, 4 PCI, 3 ISA, built on hard drive & floppy controller, 2 serial & 1 parallel ports, 2 USB ports, fits ATX cases $93

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ASUS P-5-A, VIA 100 MHz. bus chipset, 512k cache, 1 AGP, 4 PCI, 2 ISA, 3 SDram sockets for memory, built on hard drive & floppy controller, 2 serial 1 parallel & 2 USB ports built on, fits ATX cases $95, P5-A-B $96

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This Means War!

Two sims fit to fight

While we were tearing into the following titles, the NATO air campaign was still raging over Yugoslavia. Surface ships launched cruise missiles against Serbian army bases, and Apache choppers flew in to rescue downed fighter pilots. While the whole NATO campaign smelled a lot like *Wag the Dog* to us, we were left to wonder: Are *Fleet Command* and *Apache Havoc* just more examples of life imitating art, or is it the other way around?

—Bill Trotter

Apache Havoc

There's nothing "lite" about *Apache Havoc*. It sports an aristocratic pedigree, since it was designed by the former Digital Integration blokes responsible for such past classics as *Tornado*, *Hind*, and *Apache Longbow*.

Flight models are realistic for both Russian and American helicopters, and the terrain engine is one of the most impressive we've seen in any flight sim. Each of the four dynamic campaigns takes place over theaters that are *25 times* as large as those in *Apache Longbow*. The Cuban arena alone comprises 35,000 square kilometers of incredibly detailed geography and infrastructure. And, yes, you really can use pop-up tactics from behind trees or ridges, often with an uncanny illusion of depth.

Apache Havoc offers a realistic flight model, but requires hefty hardware.

More than 70 weapons systems are lovingly detailed and fully articulated. Rotor blades sag at low RPM, doors open and close, different missiles leave different smoke trails when they launch. Such fanatical dedication to realism will surely please the hardcore sim addicts, but the learning curve isn't so daunting as to discourage more casual gamers. The manual (beefy and lavishly illustrated) is excellent.

The trade-off for all this visual glamour is hardware requirements that render the game unplayable on anything but a high-end system. Ostensibly, you can run it with all the options on with a 266MHz Pentium, but we'd recommend a Pentium II 300MHz at least. And while you're upgrading your processor, you might spring for a new Voodoo^3 3000 card, too. A high admission price just to play one simulation, no matter how fine it is.

Other flaws: a lot of embarrassingly bad voice-acting, chronic stupidity on the part of your wingman, and restrictive cockpit views.

But despite these quibbles, *Apache Havoc* is fine enough to challenge *Longbow* for the title of "Best Attack-Chopper Simulation Ever."

The heads-up display is so realistic, you'd swear you were flying the real thing.

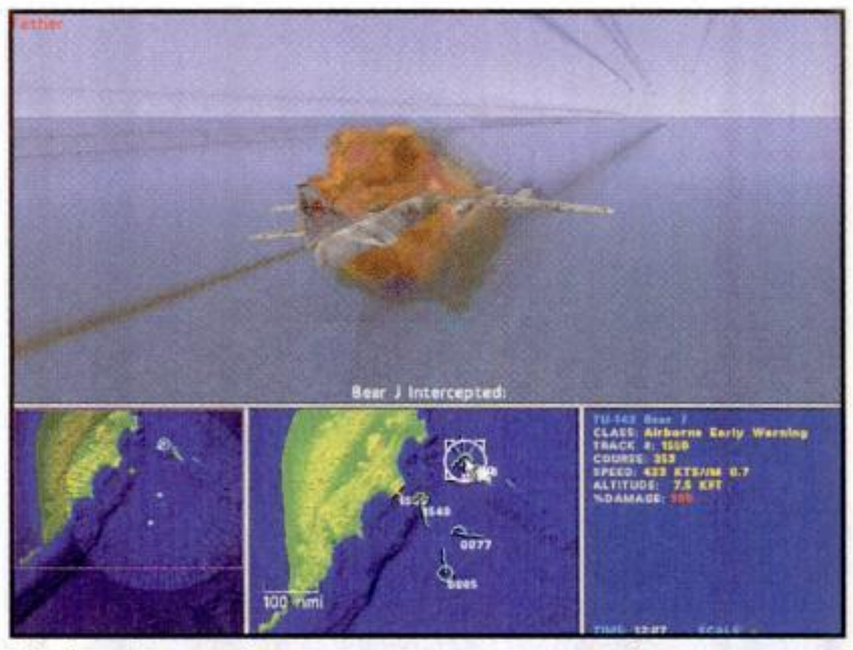
MAXIMUM PC VERDICT

Price $50
Company Interplay
Phone 949.553.6655
URL www.interplay.com

8

Jane's Fleet Command

Fleet Command has much to offer naval buffs, especially those who've been turned off by the baroque interface and alpine learning curve of *Harpoon!* (All those sensors! All those "platforms"!). *Fleet Command* tames this complexity with an interface of crystalline simplicity. Especially welcome is the zoomable, rotatable 3D-action window. You can ride torpedoes and missiles into their targets; observe sinking ships from underwater; savor a grand variety of explosions, vapor trails, and tracers; and observe dogfights, cruise missile strikes, and rescue operations.



The bombing raids continue minus one Tupolev Bear.

Clean interface, snappy graphics, lots of bang-bang… and yet, surprisingly for a Jane's product, the Fun Factor has been raised at the expense of realism. There are no formation commands, no customized weapons' load-outs for aircraft, no long-range AIM54 missiles. The campaigns are over-scripted to a fault and nearly impossible to win. And the manual is a disgrace, a scrawny thing that gives you only the bare bones of basic commands and not a word of tactical advice. Can you spell "strategy guide," boys and girls?

For all its compromises, we enjoyed *Fleet Command*'s sleekness of play and intense action. But it is, finally, just *Harpoon Lite*, and we expect something much deeper from Jane's.

MAXIMUM PC VERDICT

Price $50
Company Origin Systems
Phone 800.245.4525
URL www.janes.com

6

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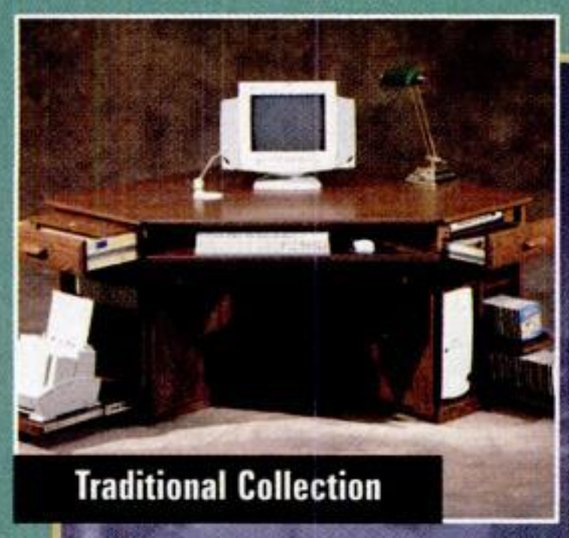

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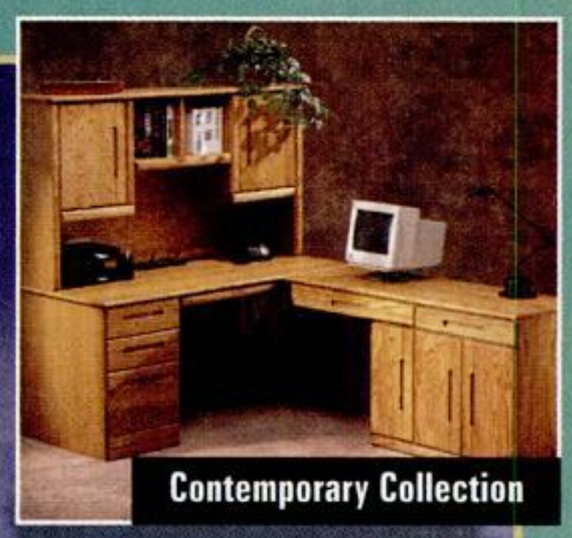

Contemporary Collection

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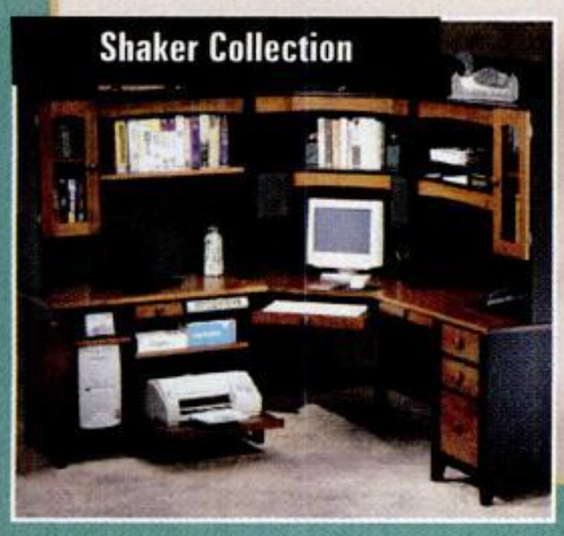
on Oak Solids
and Veneers

Classic Maple

Cherry and Honey Finish
on Hard Rock Maple Solids
and Veneers

Cherry and Black Finish
On Hardrock Maple
Solids and Veneers



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Mission Cherry
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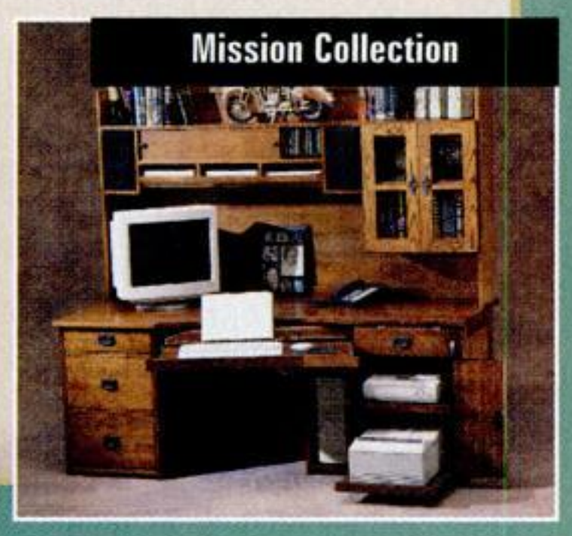
and Veneers



Mission Collection

bleem!

PSX gaming on your PC

THE SPECS

3D CARD SUPPORT
Direct3D

MULTIPLAYER
TCP/IP | IPX
12 players max

3D SOUND
None

CONTROLLER
DirectInput

PLUSES
Plays almost any PSX game
When it works, *bleem!* looks better than PlayStation

MINUSES
Two out of three times, glitches kept it from being great
Sound was never quite right

You're dying to get your gaming mitts on *Syphon Filter, Gran Turismo,* and *Vigilante 8*. There's just one problem: You don't own a PlayStation. And while you'll shell out $150 for the latest 3D hardware for your PC, you wouldn't drop that kind of money on a console just to play games. Thanks to *bleem!*, a PlayStation software emulator, you can now run most PlayStation games from your PC's CD-ROM drive. And since *bleem!* takes advantage of 3D hardware, 3D games such as *Tekken 3* and *Jet Moto 2* look even better than they do on a PlayStation.

bleem! is awesome once you get the 3D graphic and audio settings adjusted—but correctly dialing in all those options is no small task, and depending on your machine, the process can be futile. In fact, considering the infinite number of PC hardware variables, it's a wonder *bleem!* works at all. But work it did, though each game played with its own set of problems and we consistently experienced poor sound quality. Supported games such as *Gran Turismo* looked great despite graphic hiccups such as the rearview image bleeding out of the rearview mirror (a recently released patch fixes this problem, but we don't advocate the practice of "sell now, patch later"). Even some unsupported games, such as *Twisted Metal,* played using *bleem!*, albeit not well.

Despite general bugginess, bleem! can make games such as Battle Arena Toshinden 3 look as good as, if not better than, they do on a PlayStation.

Depending on your 3D card (we tested with a Diamond Monster II), you may have problems getting a full-screen display and must play instead within a 320x240 window. Bottom line: There's a lot of potential here, but *bleem!* still has too many bugs to make it a viable alternative to the real thing.

—Shane Mooney

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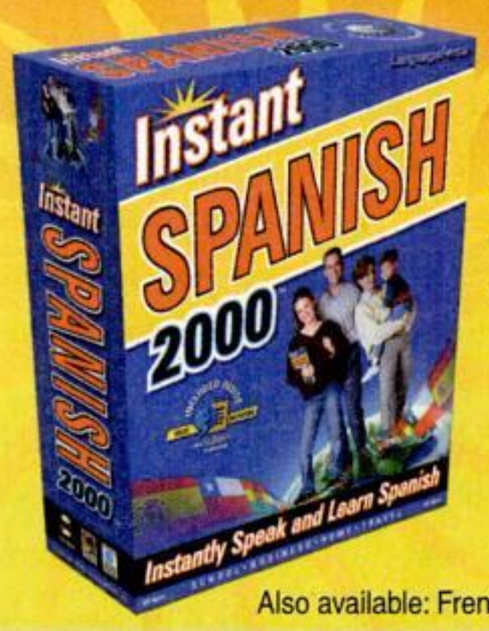

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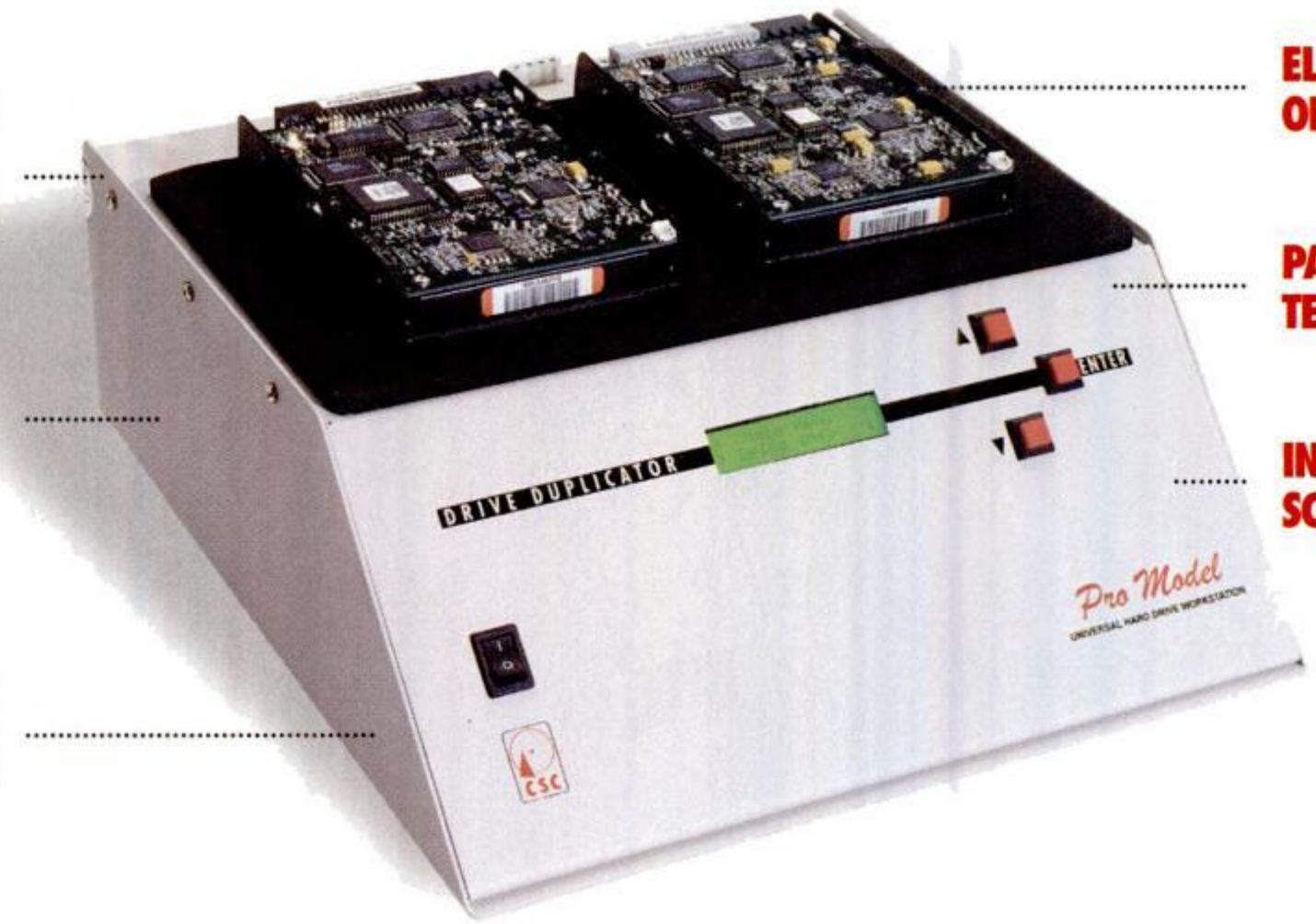

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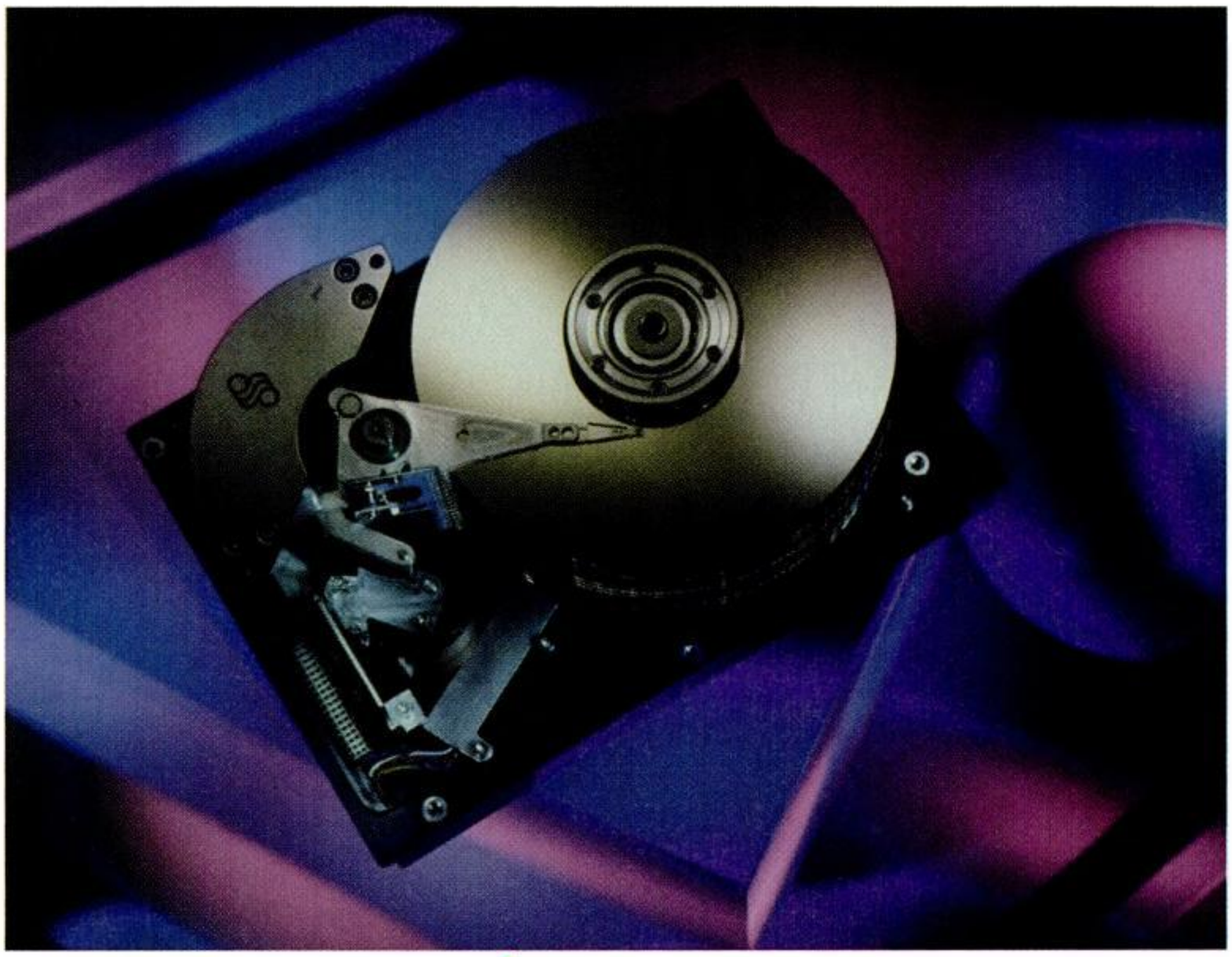

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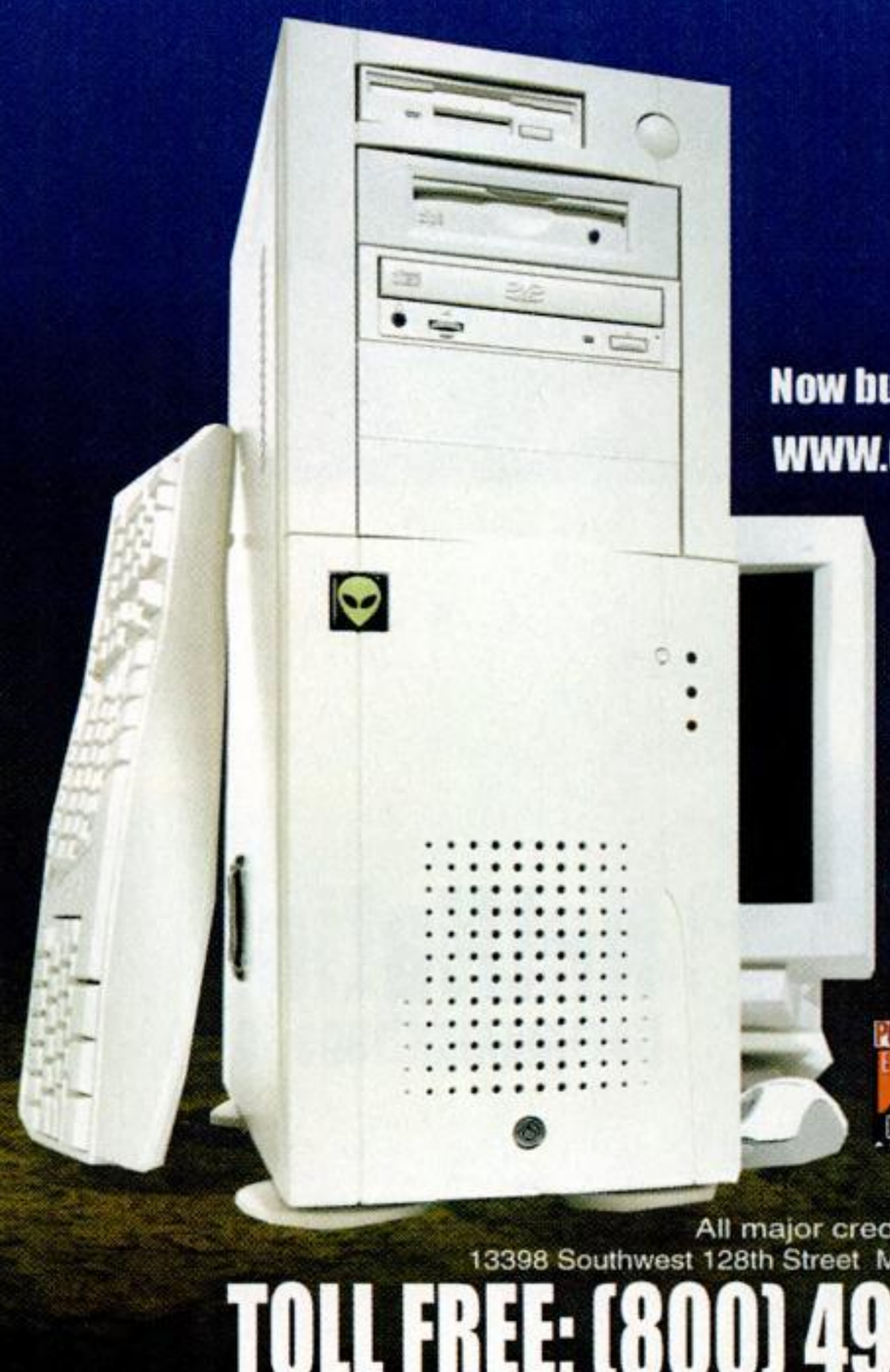

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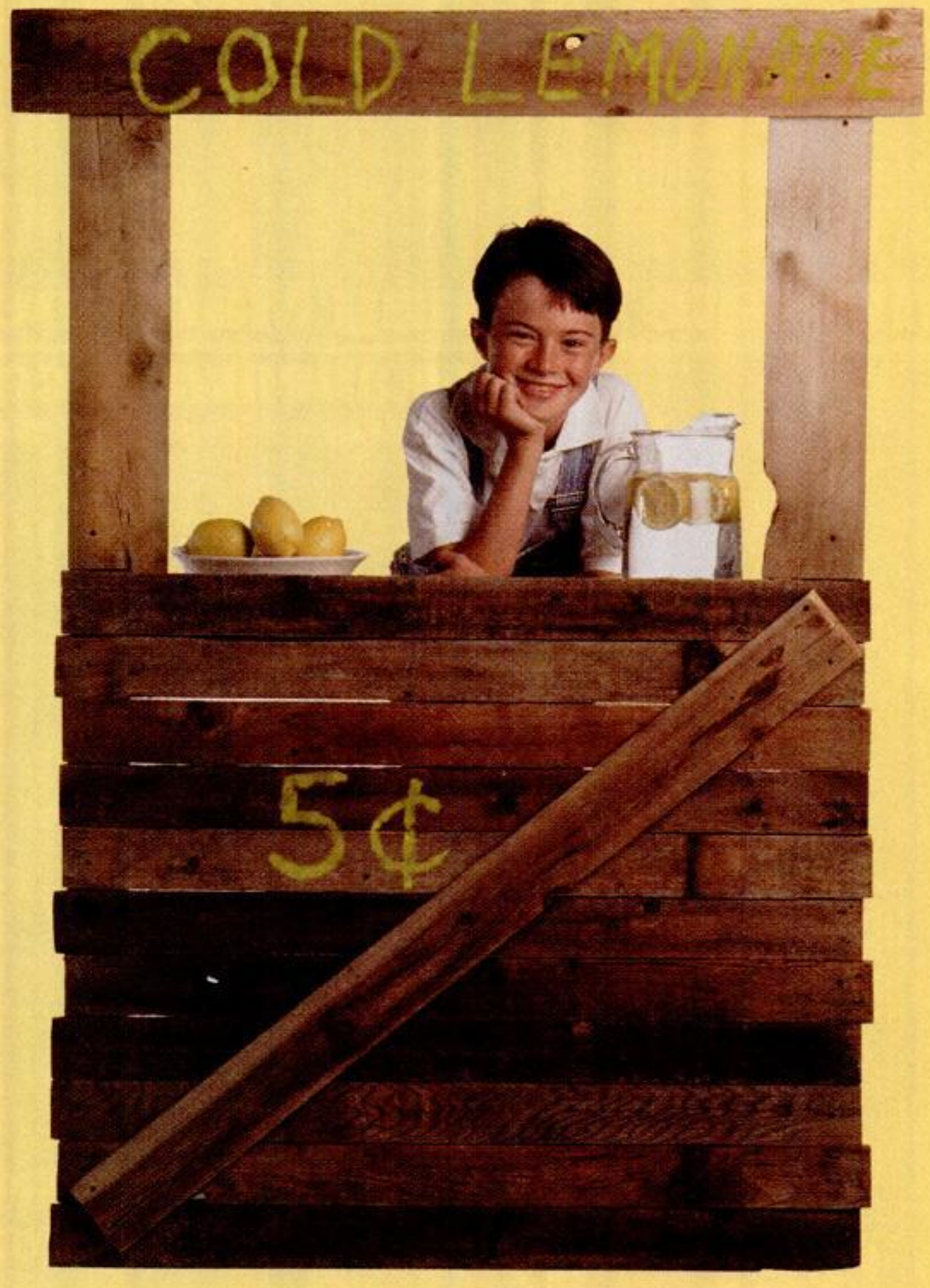

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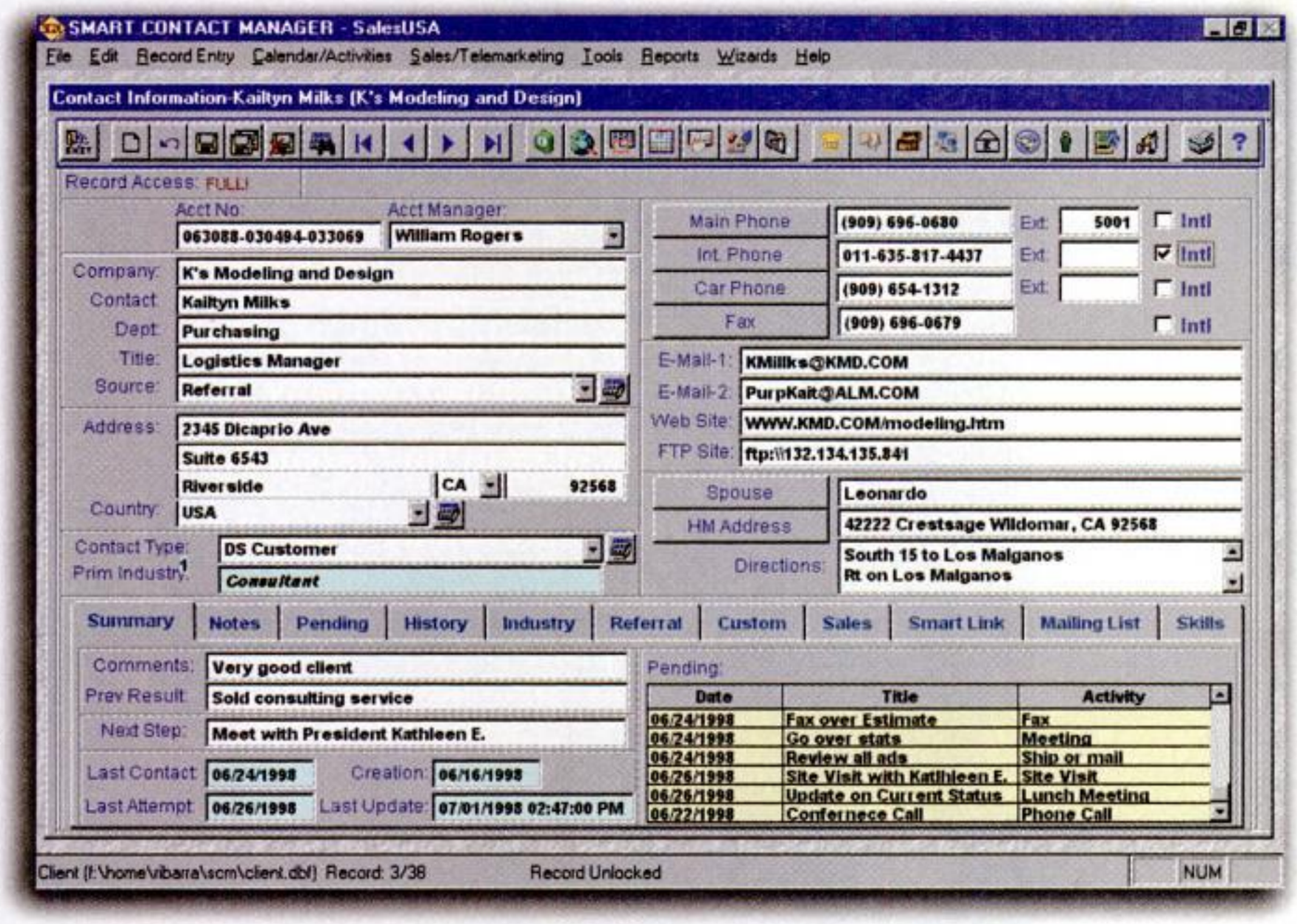
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TERMINATOR

Tech Terms Revealed ▶

Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. Terms appearing in **blue** within the Terminator are updated definitions of previously explained concepts.

A

anti-aliasing A technique that smooths the edges of diagonal lines on the screen. Without anti-aliasing, diagonal lines often have a "jaggy" appearance caused by the stair-step effect of the pixels. Anti-aliasing blurs the edges of the lines. In 3D graphics, bilinear and trilinear filtering provides anti-aliasing for textures.

API Application Programming Interface. A collection of subroutines—usually part of an operating system—that application programs can call upon to perform common tasks. For example, a program might call an API routine to display a window on the screen. APIs reduce the amount of code programmers have to write.

B

BIOS Basic Input/Output System. Software that contains your computer's most rudimentary instructions on how the operating system communicates with hardware. Your BIOS runs at startup, configures devices, and then boots the OS. Because the BIOS is so integral to getting your computer started, it's stored on a separate ROM chip, not your hard drive, to isolate it from crashes.

C

Category # Cable The rating placed on UTP cable by the Electronics Industries Association (EIA) to explain how fast a cable can transmit data. Cat cabling is broken down as follows:
Cat-1 and -2: Used for voice and low-speed data.
Cat-3: Used for data speeds up to 16Mbps.
Cat-4: Used for data speeds up to 20Mbps.
Cat-5: Used for data speeds up to 100Mbps.
Cat-5 Enhanced: Used for data speeds up to 200Mbps.
Cat-6: Used for data speeds up to 600Mbps.

CCD Charged Couple Device. It is a tiny silicon wafer that's built into many of today's digital cameras and video camcorders. It's a sensor used to convert light into a video signal, made up of thousands of tiny, light-sensitive pixels that react to incoming light. Its tiny semiconductors are connected so that the output of one serves as the input of the next. From there, the light is converted into an electrical signal that can be recorded onto a videotape.

CISC Complex Instruction-Set Computing. CISC is an architectural design style for microprocessors that dates back to the 1970s. CISC processors try to conserve memory and other system resources by encoding program instructions in a compact format and by using complex instructions that perform multiple operations.

codec A tool (either software or hardware) that takes an analog signal and converts it to a digital signal and compresses it to your hard drive.

compiler A tool that programmers use to convert their code into object code (also known as binary code, executable code, or machine code). Object code is the actual code that runs on a computer. Compilers also check for errors in source code.

core The main logic circuits of a microprocessor chip (CPU). The term usually refers to the micro-architecture (internal design) of a CPU, exclusive of buses and caches. For example, Intel's Pentium III and Celeron processors have virtually identical cores, even though they have different configurations of L2 caches and buses.

CPU Central Processing Unit. Another term for a microprocessor chip.

CSMA/CD Carrier Sense Multiple Access/Collision Detection. The media-sharing scheme used by Ethernet. Basically, it allows computers to communicate with each other only after it detects when the cable is not in use. Machines can be requested to resend their data when CSMA is combined with collision detection and collisions have been detected.

D

DHCP Dynamic Host Control Protocol. DHCP is used to dynamically assign IP addresses to machines. Utilizing a DHCP server greatly decreases the workload of Windows NT administrators, since it automatically assigns all the TCP/IP information required by a machine. It also allows them to manage their entire collection of IP addresses in one place. You may be familiar with the infamous Windows message that asks "Obtain an IP address from a DHCP server?"

DirectX A collection of Application Programming Interfaces (APIs) developed by Microsoft. This driver model helps create a unified multimedia platform on PCs. Parts include Direct3D, DirectSound, DirectInput, DirectDraw, and DirectPlay. Multimedia developers can theoretically write to the standard DirectX API and know hardware that supports it will work instead of writing to individual hardware APIs. It also allows graphics applications to take advantage of hardware acceleration supported by graphics accelerators.

DSP Digital Signal Processor. A special type of microprocessor chip that's optimized for performing repetitive operations on large sets of data. DSPs are often used for communications, networking, multimedia, and other specialized tasks.

DTMF Dual Tone Multi-Frequency. The system used by touch-tone telephones. DTMF assigns a specific frequency, or tone, to each key so that a microprocessor can easily identify it.

F

Fahrenheit Either a collaborative effort between Microsoft and SGI to merge the best elements of DirectX and OpenGL into one API, or the victory lap that Microsoft makes after it co-ops all the OpenGL technology into DirectX. Time will tell.

Fast Ethernet see 100BaseT

fill rate The number of pixels that a videocard pumps on screen during a fixed span of time; measured in millions of pixels per second.

FAT A DOS- and Windows-based file system that tracks the location of data on a disk using File Allocation Tables (FAT), which are simply tables of numbers that indicate the status of a cluster or the location of the cluster belonging to a file. A directory table is used to track file names, extensions, dates, and other info, including the FAT address of where the file starts. When a file is requested, the table is checked, and the cluster containing the file is located. The address of the next cluster is also located if the file is larger than a single cluster until an END OF FILE designator has been reached. A FAT entry of 0 indicates that the cluster is free to be written to. DOS actually writes two FATs to a logical volume where the second is used to replace the primary in case it becomes damaged.

FAT32 A 32-bit file system that was introduced with Windows 95 OSR2 that uses 4K cluster sizes for all drive sizes with a maximum capacity of 8GB.

FireWire IEEE 1394, as it's commonly referred to, was conceived by Apple Computer and then developed within the IEEE 1394 Working Group. The spec allows for the transport of data up to 200Mbps, the ability to add and remove devices without powering them down first, and the ability daisychain up to 63 devices with cable lengths up to 14 feet.

full-duplex A transmission mode that allows network adapters and servers to transmit and receive data simultaneously. This requires twice the bandwidth and a hub or switch that supports this mode.

function unit A collection of circuits in a microprocessor that executes program instructions. There are different types of function units for different types of instructions: integer, floating point, multimedia, etc.

G

Glide 3Dfx's proprietary programming interface (API) for its Voodoo family of videocard accelerators. It's usually faster and easier to program for than Direct3D.

GUI Graphical user interface. The windows, buttons, menus, scrollbars, and other graphical screen elements that allow a user to control a program. The alternate style is called a CLI (command-line interface)—users type commands at a screen prompt, as in MS-DOS.

H

half-duplex A transmission mode that only allows network adapters and servers to transmit and receive data in one direction at a time. All hubs and switches support this mode of transmission.

Hi8 A videotape format like VHS, but about a 1/4 of the size.

hub A cabling system for both 10BaseT and 100BaseT connections that essentially provides each network node its own discrete wiring connection. This is to isolate links that have stopped working or that may be malfunctioning, preventing problems from taking down the rest of the network. Even with

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two computers, it's best to use a hub. Unless the hub contains switching, all connected computers must contain the same types of connections: either 10BaseT or 100BaseT.

I

IEEE 802.3 An IEEE standard that describes twisted-pair Ethernet wiring using baseband signaling. Although IEEE 802.3 generally covers speeds all the way up to 10Mbps, it is generally now only used in reference to 10BaseT.

IEEE 802.3u An IEEE standard that covers 100Mbps Fast Ethernet.

IPX Internetwork Packet Exchange. A networking protocol developed for Novell NetWare networks that can route messages from one node to another. It's usually used in conjunction with SPX so that complete delivery of data packets is guaranteed. IPX data packets include network addresses which is why it is a routable protocol. IPX resides at layers 3 (Network Layer) and 4 (Transport Layer) of the OSI model.

J

JLIP Joint Level Interface Protocol. Used by JVC to transmit data from its camera to a computer.

M

Master Boot Record The MBR is a program that exists on the first physical sector of a hard drive and other media such as CD-ROM, floppy, and Zip disks that are used to boot a system. It also contains the Partition Table.

MBR see Master Boot Record

MMX Unofficially it stands for Multimedia Extensions, though Intel insists it's just a brand name. Introduced in early 1997, MMX consists of 57 new instructions that speed up some multimedia tasks in x86-compatible microprocessors. It's also supported by chipmakers AMD, Cyrix (National Semiconductor), and Centaur Technology (IDT).

MPEG Moving Picture Experts Group. The name of a family of standards used for coding audio-visual information (movies, video, and music) in a digitally compressed format. MPEG-1 was the first standard developed by the group and coded an audio-visual signal at a bit rate around 1.5Mbps, about the same as VHS. It's primarily used for CD-ROMs and VCDs (Video CD). MPEG-1 provides a resolution of 352x240 at 30pfs in 24-bit color. Audio is CD quality with a format of 256Kbps at 48Hz in two channels (stereo). MPEG-2 was designed to produce higher-quality images at higher bit rates (3 to 10Mbps). It delivers true broadcast-quality video at a resolution of 720x486. It's also the standard specified for DVD. MPEG-2 supports AC3 Dolby Digital audio with surround sound, providing up to six separate channels.

multitexturing The process of applying multiple textures to polygons in a model.

N

NetBEUI NetBIOS Extended User Interface. Pronounced "net-booey." A networking protocol used by Windows. It is a transport layer for NetBIOS.

NetBIOS Network Basic Input/Output System. This is basically software that allows computers and applications to communicate with each other over the same cabled DOS and Windows network. NetBIOS was originally native to the NetBEUI transport-layer protocol, but today it can work with both TCP/IP and IPX/SPX. NetBIOS computers use a unique 15-character name to communicate. This name are translated to IP addresses (via an LMHOSTS file or a WINS server) for TCP/IP.

NIC Network Interface Card. A shortened term that refers to network adapters.

node Any computer connected to a network is referred to as a node.

O

100BaseT Also called Fast Ethernet. This is a high-speed version of the IEEE 802.3u standard that allows data to be transmitted at speeds of 100Mbps instead of only 10Mbps. This requires that all machines have 100BaseTX nodes that are connected to a hub or switch that supports 100BaseTX using at least Category 5 (Cat-5) telephone cabling.

100BaseTX Another version of Fast Ethernet, it consists of two pairs of high-quality twisted-pair wires. See 100BaseT.

OpenGL Open Graphics Language. An easy-to-use (for programmers anyway) graphics API created by Silicon Graphics. It's generally accepted in the high-end workstation market. In the Windows 9X world, OpenGL plays David to Microsoft's Direct3D Goliath or vice versa. It's a Chevy versus Ford debate with both sides locked and loaded.

P

PCB Printed Circuit Board. Any one of the familiar green or brown boards that features chips and other types of electronic circuitry. Motherboards, videocards, network cards—they're all PCBs.

PCI Peripheral Component Interface. 32/64-bit expansion slot/bus interface (running at 33MHz, or half the system-bus speed, and occasionally at 66MHz) developed to help break the slow 8/16-bit Industry Standard Architecture (ISA) bus bottleneck, which ran at 8MHz. This faster bus allows faster data transfers, thus speeding up any input/output. Videocards, I/O cards, SCSI cards, and other high-speed devices benefit greatly from the PCI interface's faster speeds.

R

register A small storage cell in a microprocessor that temporarily holds numbers used by a running program. Usually the registers are 16, 32, or 64 bits wide. Program instructions put values in the registers, perform operations on the values, and copy the results back to memory.

REM Stands for remark. When a computer programmer or batch-file author wants to include material in his code that should be ignored by the computer during execution, he will "remark-out" the statement by putting REM or a semi-colon (;) in front of it. The computer will ignore any REM'ed statement and move to the next line. REM statements are typically used by programmers to explain code idiosyncrasies to anyone who might open the code at a later date.

RISC Reduced Instruction-Set Computing. RISC is an architectural design style for microprocessors that was invented to supersede CISC. It tries to maximize performance by encoding program instructions in a fixed-length format and by using simpler instructions that execute in fewer clock cycles.

S

SCSI Small Computer System Interface. Pronounced "Scuzzy." A standard high-speed parallel interface defined by the X3T9.2 committee of the American National Standards Institute (ANSI). It is an interface like IDE that allows up to seven peripheral devices to be linked to a single controller. It is perfectly suited for true multitasking environments such as Unix and Windows NT with its ability to manage large storage devices such as hard drives and access its devices concurrently. It comes standard on most Macintoshes, but requires an expansion board, or host adapter, in most PCs.

SSE see Streaming SIMD Extensions

SPX Sequenced Packet Exchange. A networking communications protocol used by Novell NetWare networks to control the transport of messages by ensuring that IPX messages arrive at their destination intact. SPX resides at layer 4 (transport layer) of the OSI model.

STP Shielded Twisted Pair. A type of cabling similar to UTP but with additional layer of shielding, usually in the form of aluminum-foil or woven-copper shielding that's specifically designed to reduce electrical noise absorption. See UTP.

Streaming SIMD Extensions (SSE) A set of 70 instructions from Intel that speed up the Pentium III's floating-point, integer, and memory streaming power. SIMD stands for Single Instruction Multiple Data. This processing strategy tells a single programming instruction to perform the same operation on two or more pieces of data. SSE is similar to 3DNow! but brings more to the table via new integer and memory streaming enhancements. As is the case with 3DNow!, games and applications must be optimized for SSE to take advantage of the performance boosts.

superscalar Parallelism. A superscalar microprocessor can execute more than one program instruction at a time. Multiple function units make it possible.

switching Also called Ethernet Switching. This is a technique that improves performance and throughput of individual nodes by removing contention by essentially making each adapter perform as if it were the only one on the network. Since each connection is seen as an individual wiring hub, much more traffic can be accomplished and multiple types of topologies can be connected to the same switching hub. This means both 10BaseT and 100BaseT connections can be attached without throughputs faltering. So machines containing 100Mbps connections will only slow down when talking to 10Mbps connections but not with each other.

system bus The main input/output bus on a microprocessor. It's the interface that connects the CPU to most other system devices, such as main memory (RAM), PCI devices, the AGP card, the system chipset, and often the Level 2 (L2) cache. Also known as a frontside bus.

T

10BaseT The original version of the IEE 802.3u standard that allows data to be transmitted at a speeds of 10Mbps using twisted-pair telephone cable.

texel Short for TEXture ELement. Refers to the individual pixel that makes up a bitmapped graphic that is used as a texture when it's applied on a polygon.

texture The surface graphics on a 3D object. Without textures, 3D objects look like naked skeletons of polygons. Textures add realism—a brick wall, the skin of a lizard, or the gleaming metal surface of a spaceship. A 3D program stores a texture as a graphics pattern and applies it to the structure of polygons. 370-pin socket An unofficial term for a 370-pin CPU interface introduced by Intel in 1998. Sometimes it's called Socket 9, because Socket 8 was the Pentium Pro's interface and Socket 7 was for Pentium-class CPUs.

texture compression The ability to shrink texture data down from a larger size down to a smaller size by replacing certain types of data (determined by the compressor) deemed redundant and replacing it with an approximation that will be used in the lower-sized palette. This often results in lower-colored textures and could also cause some visual artifacts to be introduced, resulting in a dithered effect.

U

UTP Unshielded Twisted Pair. The most popular type of cable used with both 10BaseT and 100BaseTX connectors. It consists of pairs of copper wires with plastic casings that are twisted together and enclosed by an outer jacket. The twists improve transmission and help resist interference.

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Coming Next Month...

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DREAM MACHINE 1999

Maximum PC's editors show you how to build your own ultimate dream system. From seating the motherboard, to setting drive jumpers, to clocking the CPU, we take you through the whole step-by-step process. Includes part-by-part buying guides along with our choices for "Extreme Machine of the Century."

THE SAINT

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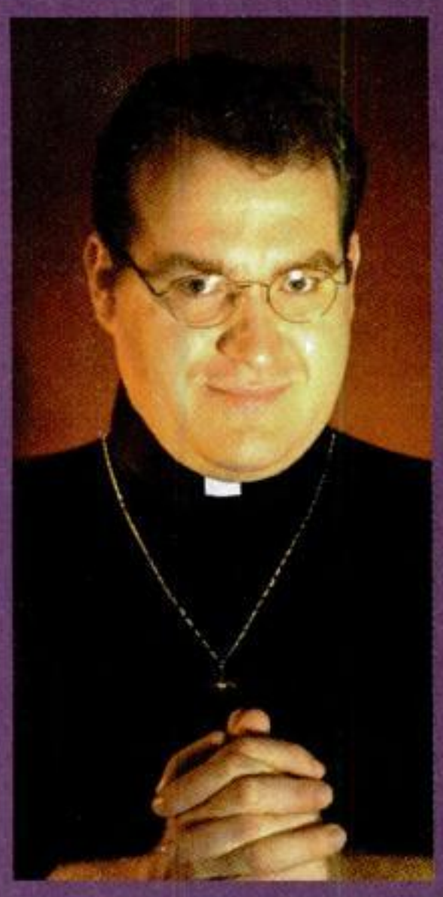

ALEX ST. JOHN
was the architect of DirectX while an evangelist at Microsoft. Since leaving the empire, he has remained a player, brokering many deals in the industry. Reach him at **saint@maximumpc.com**.

Sadly, this will be The Saint's last column for *Maximum PC*. As much as I've enjoyed writing for the magazine, I've finally managed to create a distraction for myself of sufficient proportions to occupy all of my available time. Many who read my columns regularly will know that last year I started a company called WildTangent, and by the time you read this, we'll have shipped our first product—WildTangent Web Driver. Think of it as DirectX for the Internet.

Which takes me back to when I started work on DirectX, way back in 1994. Video games were played in DOS; they ran in 320x200 and 8-bit color; they needed SoundBlaster; and a handful could limp along over a 14.4K modem connection. *Doom* was the pioneering multiplayer game, and at that time I believed PC games could not compete against console games. That is, unless a standardized driver architecture was put in place, allowing PC hardware companies to innovate in a structured way.

Without driver standards, the PC game industry could not evolve. At that time I wrote a document for Microsoft executives about why games would be critical to Microsoft's future, how they might evolve under Windows, and what we should do to support them. That document was called "Taking Fun Seriously." It was read by Bill Gates and Steve Ballmer, and promptly ignored.

But we built the technology anyway.

Off on a Tangent

THE SAINTS SIGNS OFF WITH SOME PREDICTIONS

The document in its entirety is posted on the **maximumpcmag.com** web site in the Re:Print section. I'm passing this on to all my readers as a public record of how great things can begin.

In that document, I made several predictions about how the technology I was planning to create would affect the game market. Some highlights include: "DOS will be largely dead as a game OS in two years, Windows titles will quickly occupy the full 8% of revenue made in PC games, and will rapidly capture market against console systems. If the game SDK ships in 1995, the first real game titles will appear for Windows by Xmas 95, though many of them may be ports of technology first released on DOS or other platforms. By Xmas 96, the coolest new titles will see first release on Windows."

It's been five years, and these prognostications all came true. Now I believe we've reached another major turning point in multimedia innovation. So I'll tell you what's going to happen over the next five years.

Some 90% of all multimedia content/applications will be written in common scripting languages such as Java, JavaScript, or VisualBasic. Every web designer will be a game developer. The migration to script will finally make multimedia content trivially portable to other platforms. Gaming will evolve to have many of the same characteristics as major sporting events. All the big money will be in massive multiplayer network games. Games will become constantly evolving entities that update themselves with patches, features, new content, and advertising. Many of today's game technologies will be applied to more practical applications on the Internet such as mapping, travel, searching, stock tracking, etc. The net won't look like text and bitmaps anymore. Live 3D graphics will become the streaming-video compression format of choice. Customer support will be a button you click in your application.

Of course, predicting the future is much easier when you have a hand in shaping it. My "DirectX for the Internet" is not simply a repackaging of Microsoft's API. It's a bridge to migrate from an old way of building interactive content to a better way. This is just the first generation of a technology that I believe can dramatically improve game development, portability, support, marketing, functionality, distribution, quality, and performance for everybody.

DirectX drivers make it possible for one set of game code to run on dozens of different multimedia hardware configurations. The WildTangent Web Driver takes abstraction a step further and makes it possible for one set of code to run across different languages, browsers, bandwidths, and operating systems. The Web Driver also makes your 3D accelerators into Internet accelerators.

It's a new idea, so I don't expect everyone to get it right away, but I guarantee you will—eventually. If you find insurmountable obstacles everywhere you look, read "Taking Fun Seriously" and consider how insurmountable that ambition was five years ago.

I wrote a document about why games would be critical to Microsoft's future. It was read by Bill Gates and Steve Ballmer, and promptly ignored.

For all of you who have read my column loyally, stay tuned. I'm giving *Maximum PC* a 24-hour lead on all WildTangent press releases. *Maximum PC* will always be my favorite magazine. Now I'm going to vacate this space for somebody with a fresh perspective, and wish all of you the greatest success in everything you endeavor to do. ✹

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- Up to 9 ppm black, 6.5 ppm color
- Parallel or USB[21] connectivity

$299

HP SCANJET 5200Cxi SCANNER

- Single push-button scanning and copying
- USB[21] connectivity for easy installation
- 600 x 1200 dpi, 9600 dpi enhanced, 36-bit color

$273

APC SURGESTATION PRO8T2

- Helps protect your system against electrical surges
- 8 outlets with block spacing for 3 outlets
- Provides $10K equipment protection warranty

$39

PREMIER 3-YEAR ON-SITE[3] SERVICE

- Sends a technician to your door the next business day if necessary after phone-based troubleshooting
- Protects your PC from expensive technical support costs down the road

$99 Desktop Service

$99 Notebook Service[19]

ll Financial Services qualified consumers. District of Columbia, ted or offer may vary ased on sales prices with approved credit. h vary (For example, p system, the total of to 5-day ground to udes sales taxes of). Taxes & shipping luded in the amount ent will be higher.

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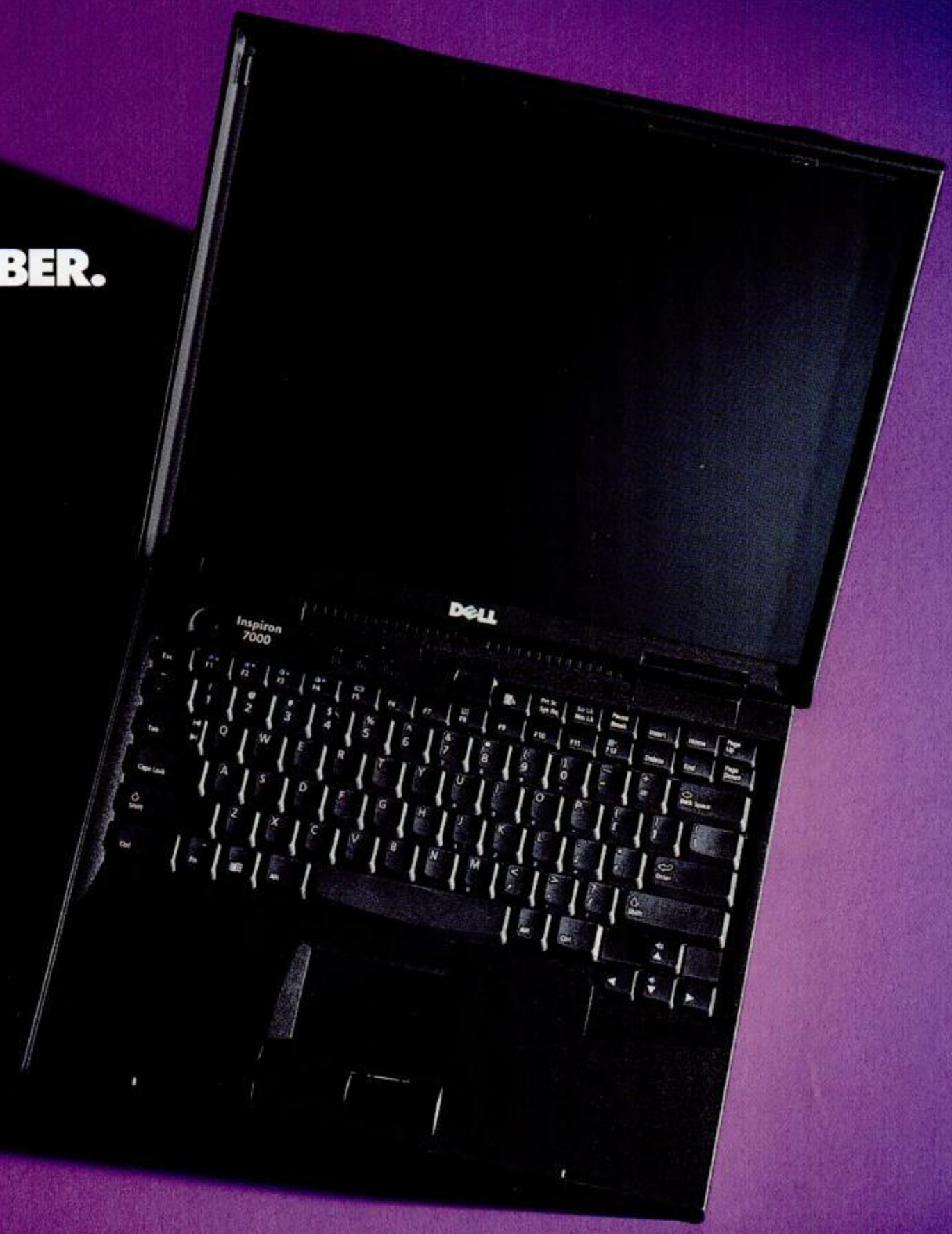

DELL® INSPIRON™ 7000 A400LT
PENTIUM® II PROCESSOR AT 400MHz

Desktop Features, Notebook Convenience

- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max[13])
- 6.4GB[4] Ultra ATA Hard Drive
- Removable Combo 24X Max[7] Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- 3D Surround Sound with Wavetable
- Lithium Ion Battery
- Internal 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect℠ Internet Access[14]
- MS® Works Suite 99 with Money 99 Basic
- MS Windows® 98 Second Edition
- Deluxe Nylon Case
- McAfee VirusScan 4.02
- Inspiron Setup Video
- 3-Year Limited Warranty[2]

$2799

$84/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88958-800727

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Packed with the Pentium® II processor at 400MHz, 8MB of VRAM and a 15-inch display, the Dell® Inspiron™ 7000 notebook lets you put the pedal to the metal. After all, you won't find these kinds of numbers on just any notebook. Because this isn't just any notebook. Call us or visit www.dell.com to build yours today.

800-545-7124

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Phone Hours: Mon-Sat 7a-11p CT • In Canada,[1] call 800-839-0148 • In Mexico,[1] call 01-800-021-4531

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pentium® II PROCESSOR

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DELL® DIMENSION® DESKTOPS

Common features: 512KB Integrated L2 Cache (128KB on Intel® Celeron™ Processor-base ◆ Universal Serial Bus (USB) Ports ◆ McAfee VirusScan 4.02 ◆ MS Windows® 98 Secon Processor-based Systems only) **Upgrades:** HP® OfficeJet 710, add $499 ◆ APC Back-UPS C

DELL DIMENSION V400c
INTEL CELERON PROCESSOR AT 400MHz

- 32MB SDRAM
- 4.3GB[4] Ultra ATA Hard Drive
- 15" (13.8" viewable) 800F Monitor
- ATI 8MB 3D AGP Graphics
- 40X Max[5] Variable CD-ROM Drive
- Yamaha XG Wavetable Sound
- harman/kardon HK-195 Speakers
- *NEW* v.90[11] PCI DataFax Modem
- Logitech First Mouse + Wheel (PS/2v)

★ ***Dell Customized Upgrade, add $159.*** *64MB SDRAM, 6.4GB[4] Ultra ATA Hard Drive, 17" (16.0" viewable, .26dp) M780 Monitor (E•Value Code: 88959-500710)*

$899

$27/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-500708

DELL DIMENSION XPS T450
PENTIUM III PROCESSOR AT 450MHz

- 96MB 100MHz SDRAM
- 6.4GB[4] Ultra ATA Hard Drive
- 17" (16.0" viewable, .26dp) M780 Monitor
- 8MB ATI XPERT 98D 3D AGP Graphics
- 40X Max[5] Variable CD-ROM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- *NEW* v.90[11] PCI DataFax Modem
- 100MB Iomega Zip BUILT-IN Drive
- MS IntelliMouse®

★ ***Dell Customized Upgrade, add $159.*** *17" (16.0" viewable, .26dp) 1000HS Trinitron® Monitor, ACS-340 Speakers with Subwoofer, 16MB Diamond Viper nVidia TNT AGP Graphics (E•Value Code: 88959-500715b)*

$1399

$42/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-500713m

DELL INSPIRON™ NOTEBOOKS

Common features: 3D Surround Sound with Wavetable ◆ Lithium Ion Battery ◆ MS W Warranty[2] **Upgrades:** Canon BJC-50 Portable Printer, add $349 ◆ Targus Defcon Notebo Backpack, add $69

DELL INSPIRON 3500 C366GT
INTEL CELERON PROCESSOR AT 366MHz

Light Weight, Light Price

- 14.1" XGA Active Matrix Display
- 32MB SDRAM (256MB Max)
- 4.8GB[4] Ultra ATA Hard Drive
- Modular 24X Max[7] Variable CD-ROM and Floppy Drive
- NeoMagic® 256AV AGP Video
- MS Works Suite 99 with Money 99 Basic

★ ***Dell Customized Bundle, add $199.*** *6.4GB[4] Hard Drive, 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect Internet Access[14], Deluxe Nylon Case (E•Value Code: 88959-800719z)*

$1799

$54/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-800717

DELL INSPIRON 7000 A366LT
PENTIUM II PROCESSOR AT 366MHz

Desktop Features, Notebook Convenience

- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max[13])
- 6.4GB[4] Ultra ATA Hard Drive
- Removable Combo 24X Max[7] Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE™ LT Pro 3D Video
- Internal 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect Internet Access[14]
- MS Works Suite 99 with Money 99 Basic

★ *Custom Leather Case, add $89.*

★ *Upgrade to a 10GB[4] Ultra ATA Hard Drive, add $149.*

★ *Upgrade to 128MB SDRAM, add $199.*

$2599

$78/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-800725

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In Canada, call 800-839-0148 • In Mexico, call 01-800-021-4531

Pricing not discountable. [1]Prices and specifications valid in U.S. only and subject to change without notice. [2]For a complete copy of Guarantees or Limited Warranties, write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. [3]At-home or on-site service provided via service contract between customer and third-party provider, and is not available in certain remote areas. Technician dispatched if necessary pursuant to phone-based troubleshooting with technical support personnel. [4]For hard drives, GB means 1 billion bytes; total accessible capacity varies depending on operating environment. [5]17X Min. [7]10X Min. [10]2X Min. [11]Download speeds limited to 53Kbps. Upload speeds are less (in the 30Kbps range) and vary by modem manufacturer. Speeds also vary depending on line conditions. Analog phone line and compatible server equipment required. [13]Maximum RAM configurations require a factory installed 128MB SoDIMM, which must be installed at time of initial purchase. [14]Offers differ for AT&T WorldNet and GTE Interactive. Some charges may apply. [19]For Inspiron 3500 only. [21]Requires Windows 98. [22]Software packaging and documentation differ from retail versions. [37]Availability of DSL service varies. Call Dell or your local DSL service provider for more details. Intel, the Intel Inside logo and Pentium are registered trademarks and Celeron is a trademark of Intel Corporation. MS, Microsoft, IntelliMouse and Windows are registered trademarks of Microsoft Corporation. 3Com is a registered trademark of 3Com Corporation. HP and DeskJet are registered trademarks of Hewlett Packard Corporation. Trinitron is a registered trademark of Sony Corporation. ©1999 Dell Computer Corporation. All rights reserved.

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d Systems) ◆ Trial Offer ConnectDirect℠ Internet Access[14] ◆ MS® Works Suite 99 with Money 99 Basic ◆ 3.5" Floppy Disk Drive
Edition ◆ Dell QuietKey® Keyboard ◆ 3-Year Limited Warranty[2] ◆ 1-Year At-home[3] Service ◆ Power Game Pack[22] (Pentium® III
ffice, add $99 ◆ HP DeskJet® 895Cse, add $399

NEW DELL DIMENSION XPS T550 PENTIUM III PROCESSOR AT 550MHz

- 128MB 100MHz SDRAM
- 9.1GB[4] Ultra ATA Hard Drive (7200 RPM)
- 17" (16.0" viewable, .26dp) M780 Monitor
- 16MB 3DFX Voodoo3 AGP Graphics Card
- *NEW* 6X Max[10] Variable DVD-ROM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- *NEW* v.90 Capable[11] PCI DataFax Modem
- Logitech MouseMan Wheel (PS/2v)

★ ***Dell Customized Upgrade, add $399.*** *SoundBlaster Live! Value 512V Sound Card, NEW 32MB Diamond Viper V770D AGP Graphic Card, 19" (18.0" viewable) P990 Trinitron Monitor (E•Value Code: 88959-500722m)*

$1899

$57/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-500718m

NEW DELL DIMENSION XPS T550 PENTIUM III PROCESSOR AT 550MHz

- 128MB 100MHz SDRAM
- 20.4GB[4] Ultra ATA Hard Drive (7200 RPM)
- 17" (16.0" viewable, .26dp) 1000HS Trinitron Monitor
- *NEW* 16MB 3D FX Voodoo3 3000D AGP Graphics Card
- *NEW* 6X Max[10] Variable DVD-ROM Drive
- Turtle Beach Montego II A3D 320V Sound Card
- ACS-340 Speakers with Subwoofer
- 3Com USR v.90[11] PCI WinModem
- 250MB Iomega Zip BUILT-IN Drive
- Logitech MouseMan Wheel (PS/2v)

$2399

$72/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-500723

NEW DELL DIMENSION XPS T550 PENTIUM III PROCESSOR AT 550MHz

- 128MB 100MHz SDRAM
- 20.4GB[4] Ultra ATA Hard Drive (7200 RPM)
- 19" (18.0" viewable, .26dp) P990 Trinitron Monitor
- *NEW* 32MB Diamond Viper 770D nVidia AGP Graphics Card
- *NEW* 6X Max[10] Variable DVD-ROM Drive and Decoder Card with TV Out
- *NEW* SoundBlaster Live! Value 512V Sound Card
- ACS-495 Dolby Surround Sound Speakers with Subwoofer
- 3Com® USR v.90[11] PCI WinModem
- 250MB Iomega Zip BUILT-IN Drive
- MS IntelliMouse

$2799

$84/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-500727m

PRE-LOADED SOFTWARE OPTIONS

Microsoft® Office 2000 Small Business Edition:
Word 2000, Excel 2000, Publisher 2000, Outlook 2000, Small Business Financial Mgr. 2000 and Expedia Streets 2000.

Microsoft Works Suite 99:
Word 97, Encarta Encyclopedia 99, Money 99 Basic, Works 4.5a, Works Calendar, Graphic Studio Greetings and Expedia Streets 98.

SOFTWARE BUNDLES

Fast Track Game Pack[22] $79:
Tomb Raider 2, Jack Nicklaus Golf 5.0, Titanic: Adventure Out of Time, Hardball 6.0 and Total Annihilation.

Quicken 99 Power Bundle $79:
Quicken Deluxe 99, Quicken Financial Planner, Quicken Family Lawyer.

indows 98 Second Edition ◆ McAfee VirusScan 4.02 ◆ Touchpad ◆ 3-Year Limited
ok Alarm, add $49 ◆ APC Notebook Surge Protector, add $29 ◆ Targus College Logo

DELL INSPIRON 7000 A400LT PENTIUM II PROCESSOR AT 400MHz

Desktop Features, Notebook Convenience

- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max[13])
- 10GB[4] Ultra ATA Hard Drive
- Removable Combo 24X Max[7] Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- Internal 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect Internet Access[14]
- MS Office 2000 Small Business plus Bookshelf 99
- Deluxe Nylon Case

★ *Upgrade to 128MB SDRAM, add $199.*

$2999

$90/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-800729

DELL INSPIRON 7000 A400LT PENTIUM II PROCESSOR AT 400MHz

Desktop Features, Notebook Convenience

- 15" XGA Active Matrix Display
- 128MB SDRAM (384MB Max[13])
- 14GB[4] Ultra ATA Hard Drive
- Removable Combo 4X[10] DVD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- Internal 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect Internet Access[14]
- MS Works Suite 99 with Money 99 Basic
- Deluxe Nylon Case

★ *Inspiron 7000 Port Replicator, add $149.*
★ *Second Lithium Ion Battery, add $119.*
★ *Quicken Power Bundle, add $79.*

$3499

$105/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88959-800734

POWER UPGRADES

NEW HP DESKJET 882C COLOR PRINTER

- Brilliant photo-quality printing on any paper
- Up to 9 ppm black, 6.5 ppm color
- Parallel or USB[21] connectivity

$299

HP SCANJET 5200Cxi SCANNER

- Single push-button scanning and copying
- USB[21] connectivity for easy installation
- 600 x 1200 dpi, 9600 dpi enhanced, 36-bit color

$273

APC SURGESTATION PRO8T2

- Helps protect your system against electrical surges
- 8 outlets with block spacing for 3 outlets
- Provides $10K equipment protection warranty

$39

PREMIER 3-YEAR ON-SITE[3] SERVICE

- Sends a technician to your door the next business day if necessary after phone-based troubleshooting
- Protects your PC from expensive technical support costs down the road

$99 Desktop Service

$99 Notebook Service[19]

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DELL® INSPIRON™ 7000 A400LT
PENTIUM® II PROCESSOR AT 400MHz

Desktop Features, Notebook Convenience

- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max[13])
- 6.4GB[4] Ultra ATA Hard Drive
- Removable Combo 24X Max[7] Variable CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- 3D Surround Sound with Wavetable
- Lithium Ion Battery
- Internal 56K Capable[11] v.90 Fax Modem with Trial Offer ConnectDirect℠ Internet Access[14]
- MS® Works Suite 99 with Money 99 Basic
- MS Windows® 98 Second Edition
- Deluxe Nylon Case
- McAfee VirusScan 4.02
- Inspiron Setup Video
- 3-Year Limited Warranty[2]

$2799

$84/Mo., 48-Month Purchase Plan[33]

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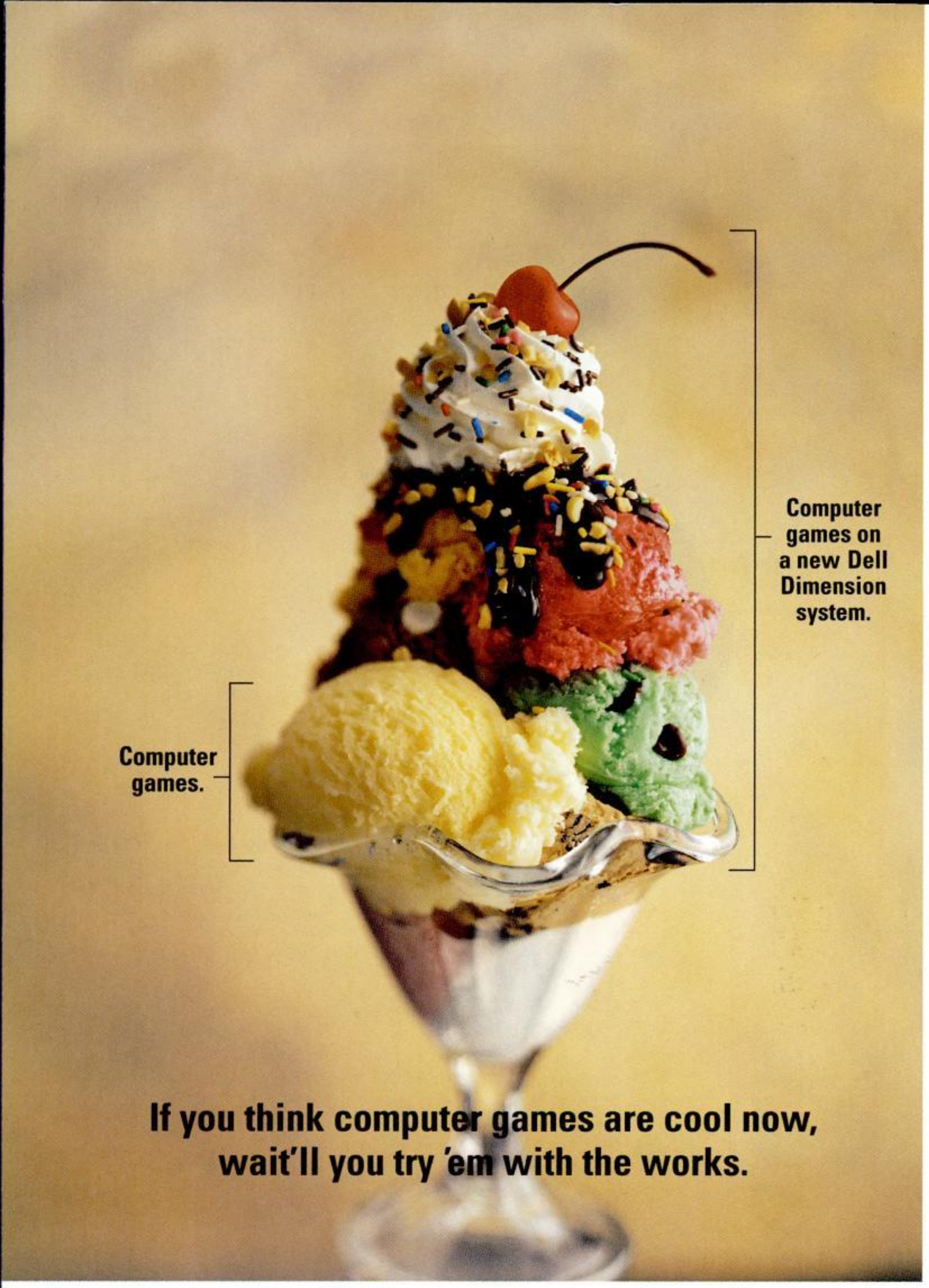
Computer games on a new Dell Dimension system.
Computer games.
If you think computer games are cool now, wait'll you try 'em with the works.

The computer graphics and sounds you've experienced before will seem like plain vanilla once you've had a taste of the Dell® Dimension® system. For starters, the 16MB 3DFX Voodoo AGP graphics card and 6X Max[10] DVD-ROM transform games and Internet eye candy into a feast for the senses. And to top it all off, you can upgrade with a 512 voice sound card, a 32MB Diamond Viper 770D nVidia AGP graphics card and a 19-inch (18.0" vis) screen. Whet your appetite @ www.dell.com.

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***NEW* DELL® DIMENSION® XPS T550**
PENTIUM® III PROCESSOR AT 550MHz

- 128MB 100MHz SDRAM/9.1GB[4] Hard Drive
- 17" (16.0" vis, .26dp) M780 Monitor
- *NEW* 16MB 3DFX Voodoo3 3000D AGP Graphics Card
- *NEW* 6X Max[10] Variable DVD-ROM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- *NEW* v.90[11] DataFax Modem with Trial Offer ConnectDirect℠ Internet Access[14]
- MS® Works Suite 99 with Money 99 Basic; McAfee VirusScan, MS Windows® 98 Second Edition
- Dell QuietKey® Keyboard
- Logitech MouseMan Wheel (PS/2V)
- 3-Year Limited Warranty[2]
- 1-Year Next-Business-Day At-home[3] Service
- **Power Game Pack**[22]

★***Dell Customized Upgrade, add $399.***
NEW SoundBlaster Live! Value 512V Sound Card, NEW 32MB Diamond Viper V770D AGP Graphics, 19" (18.0" vis, .26dp) P990 Trinitron® Monitor (E•Value Code: 88957-500722m)

$1899

$57/Mo., 48-Month Purchase Plan[33]

E•VALUE CODE: 88957-500718m

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